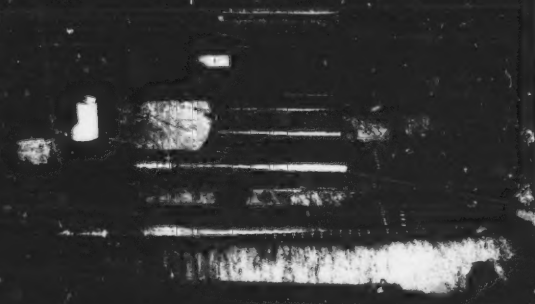




The Northern Forest Research Centre (NoFRC) of the Canadian Forestry Service is responsible for fulfilling the federal role in forestry research, regional development, and technology transfer in Alberta, Saskatchewan, Manitoba, and the Northwest Territories. The main objective of the center is to conduct research in support of improved forest management for the economic, social, and environmental benefit of all Canadians. Since 1982 the center has also assumed responsibility for the development and implementation of federal-provincial forestry agreements and employment stimulation programs in the forestry sector.

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Cover photos:

Clockwise from upper left: cut blocks near Prince Albert, salvaged fire-killed white spruce sawlogs, gang edger, and lumber ready for transport to market.

**THE FOREST INDUSTRY IN THE ECONOMY
OF SASKATCHEWAN, 1979-80**

W.J. Ondro and T.B. Williamson

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ABSTRACT

The forest industry in Saskatchewan was surveyed in 1980. The results are analyzed in this report in terms of capital, employment impact, capacity and production, markets, annual revenues and expenditures, and socioeconomic impact. Numerous tables and figures provide detailed information.

RESUME

Les résultats d'une étude sur en 1980 sont analysés dans ce rapport sur le plan des capitaux, des emplois, des possibilités et de la production, des marchés, des recettes et des dépenses annuelles et des effets socioéconomiques. On y trouve un grand nombre de tableaux et de données qui fournissent des renseignements détaillés.

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CHAPTER I

INTRODUCTION

The forest is an important natural resource for Saskatchewan but, like most natural resources, it is limited in size and exploitability. These limitations raise important policy questions. How should the resource be developed and at what rate? Who should pay the costs of resource development and management? Who are the principal benefactors of resource use? At what rate should the industry be allowed to expand? These general questions and a wide range of other more specific issues must ultimately be addressed within the political process. If these issues are to be addressed effectively, however, adequate information must be made available to policy makers, resource managers,¹ and resource users.

This report provides detailed statistics on commercial utilization of the forest resource in Saskatchewan.² The data were collected for the base year 1979-80 as part of a Canadian Forestry Service (CFS) study that had the broad objectives of describing the size and structure of the Saskatchewan forest industry and quantifying its impact on the provincial economy. The specific objectives of this study were:

1. to outline forest production facilities and their capacity by region;
2. to summarize and evaluate employment levels in manufacturing and woodlands operations;
3. to survey and assess the fixed capital stock;
4. to quantify the major forest products and identify their market destinations; and
5. to establish the major economic benefits that forest resource development provides to individual regions and to the province.

Economic Assessment Variables

The information in this report is summarized³ by industry group and by the administrative areas designated as forest regions by the Forestry Division of the Department of Parks and Renewable Resources (Figure 1). Information provided is based on inputs used by the forest industry, which are capital and labor. Each of these

factors of production is discussed in detail in separate chapters.

An evaluation of the type and quantity of forest industry products is also an essential element of a descriptive study of this type. Output by Saskatchewan's forest industry is therefore tabulated and presented by product type, region of origin, and market destination. Limiting factors for industrial expansion were also identified and analyzed in the context of underutilized industrial capacity.

Variables that can be used to assess the economic impact of the forest industry on the Saskatchewan economy include value of sales, number of employees, wages and salaries, value added, value of exports, employment multipliers, and community dependence. Because most statistical reports present these types of information in aggregate form, the evaluation of the impact of a single industry group or of the entire forest industry in one specific region is often difficult. Also, presentation of any variable by itself may not fully reflect all the economic and social factors important to policy formation and management decisions. The goal of this report is to present the full range of impact variables in greater detail than is provided by other sources.

In addition to providing a thorough quantitative assessment of primary inputs, outputs, and economic impacts, the report considers a number of other specific aspects of the industry, including technological and structural features. These features are discussed in terms of concentration of production, types of processing equipment, nature and extent of industrial integration, ownership type, length of ownership, and age of machinery.

Classification Of The Forest Industry

This report uses a specific meaning for the term forest industry. In general terms the forest industry includes all industries classified under Major Groups 4, 5,

¹ Saskatchewan's forest resources are managed by the Forestry Division of the Department of Parks and Renewable Resources. Prior to 1983 the agency was the Forestry Branch of the Department of Tourism and Renewable Resources.

² Economic assessment variables are currently collected by Statistics Canada for medium- to large-sized industry complexes. This assessment neither represents the total economic impact of the industry, nor contains sufficient detail for policy makers and management agencies.

³ Detailed information on individual firms in the Saskatchewan forest industry in 1979-80 can be obtained from Ondro et al. (1981).

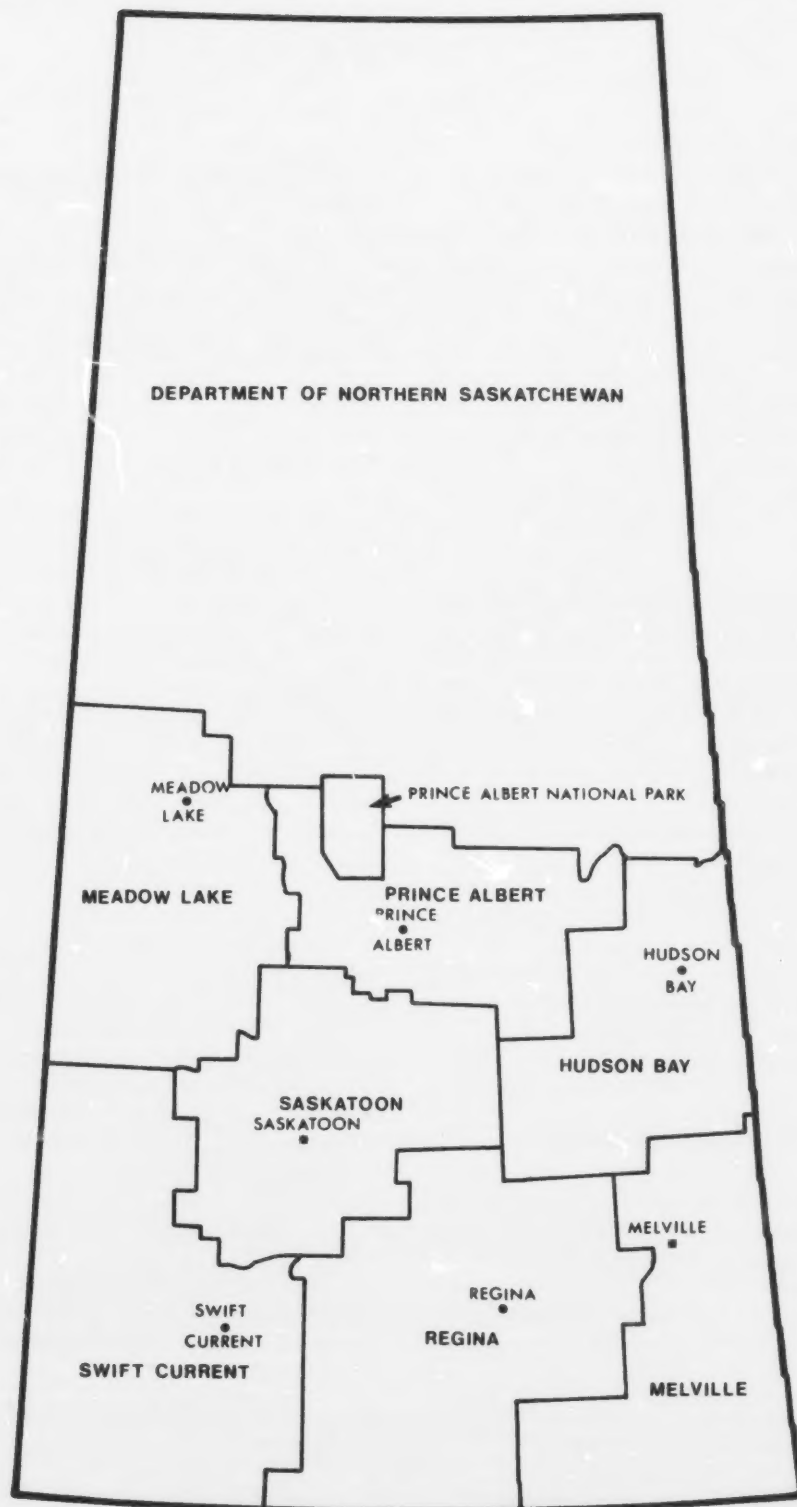


Figure 1. Forest Regions: Saskatchewan Department of Parks and Renewable Resources.

Table 1. Standard Industrial Classification Code (SIC) of industry groups included in the NoFRC forest industry survey, 1980^a

Industry group	Standard Industrial Classification Code (SIC)
Forestry	
Logging	0411
Wood industries	
Sawmills and planing mills (except shingle mills)	2512
Softwood veneer and plywood mills	2522
Wooden box and pallet	2561
Wood preservation industry	2591
Waferboard industry	2593
Other wood industries	2599
Paper and allied industries	
Pulp and paper mills	2711

^a Source: Statistics Canada 1980.

25, and 27 of Divisions C (Logging and Forestry) and E (Manufacturing) of the Standard Industrial Classification Manual (Statistics Canada 1980). Industries within these major groups are listed in Appendix 1.

For the purposes of this report, however, the term forest industry is more restricted and is limited to primary wood-using industries. It includes only those firms using roundwood or chips in their manufacturing processes. Data for the logging industry (Major Group 4, Division C — Logging and Forestry) were included where applicable. Forest industry groups that were included in the survey are listed in Table 1. In order to satisfy confidentiality requirements, data for the pulp, plywood, and waferboard mills are aggregated where sensitive information is discussed.

Data Collection Procedures And Survey Techniques

This study was designed to collect information additional to that provided by the Forest Statistics section of the Manufacturing and Primary Industry Division of Statistics Canada. A detailed questionnaire was used for larger firms and the information was collected in personal interviews conducted by representatives of the Northern Forest Research Centre (NoFRC). For small firms, an abbreviated form was used and information for this

shorter questionnaire was collected through personal interviews or by telephone.⁴

An initial list of forest industry firms was compiled from the *Directory of primary wood-using industries in Alberta, Saskatchewan, and Manitoba — 1973* (Teskey and Smyth 1974), internal records of the Department of Parks and Renewable Resources, and from the Central Forest Products Association. A complete census of all forest industry groups was performed. The distribution of forest industry firms is presented in Table 2 and locations of firms surveyed (excluding sawmills producing less than 1 MM foot board measure (fbm) annually) are shown in Figures 2 and 3.

During the months of March and April 1980, the questionnaire used for a previous study in Alberta (conducted in 1979) was redesigned. The purpose of this modification was to facilitate computer processing of the Saskatchewan and Manitoba census data. Field interviews began in September 1980. Where possible, data were collected for the 1979-80 fiscal year; otherwise data for the 1979 calendar year were obtained. All questionnaires were subjected to an office audit to ensure completion, internal consistency, and accuracy. The field interview phase was completed in December 1980.

⁴ Copies of questionnaires are available on request.

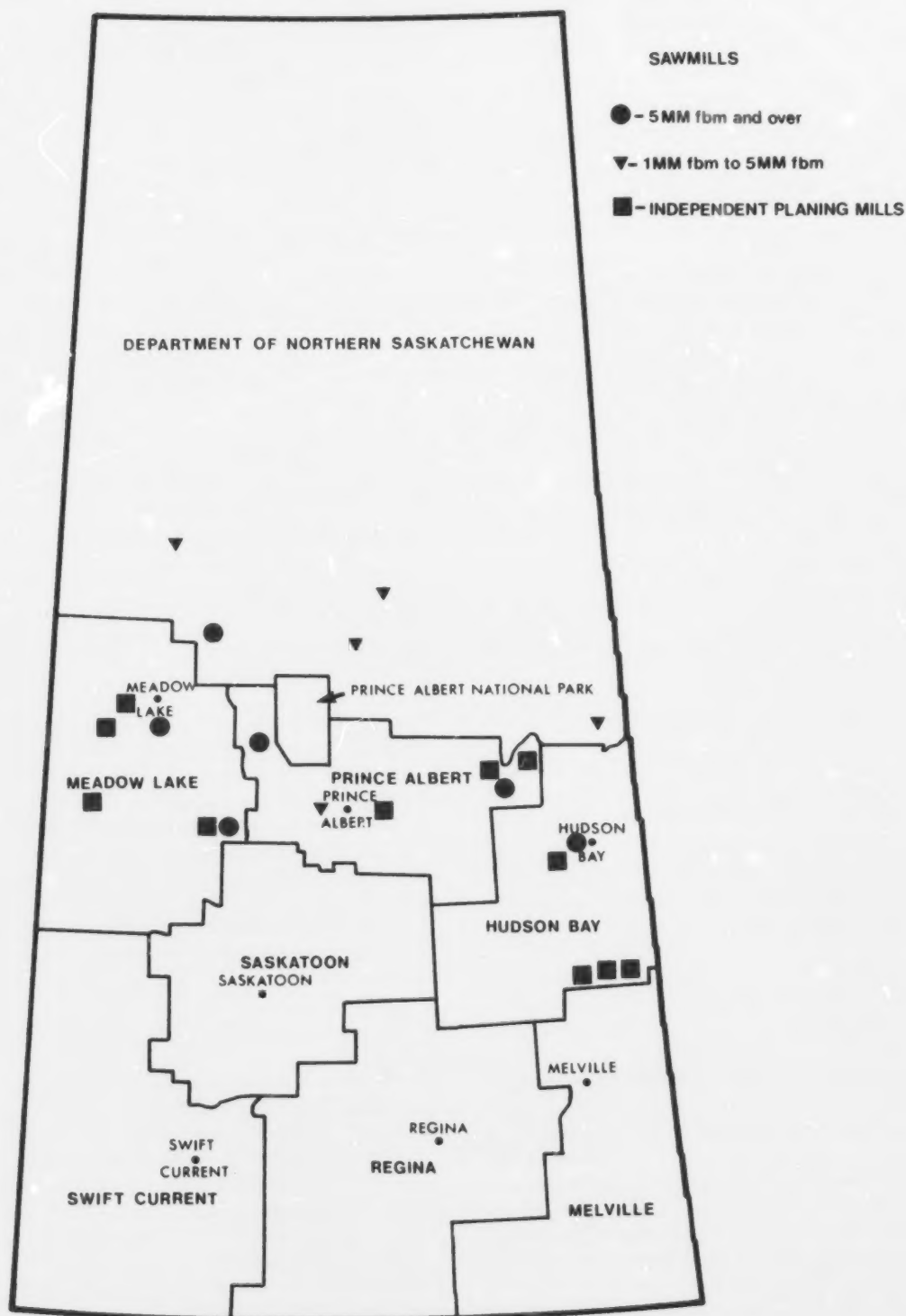


Figure 2. Distribution of the sawmill and planing mill industry, 1979-80.

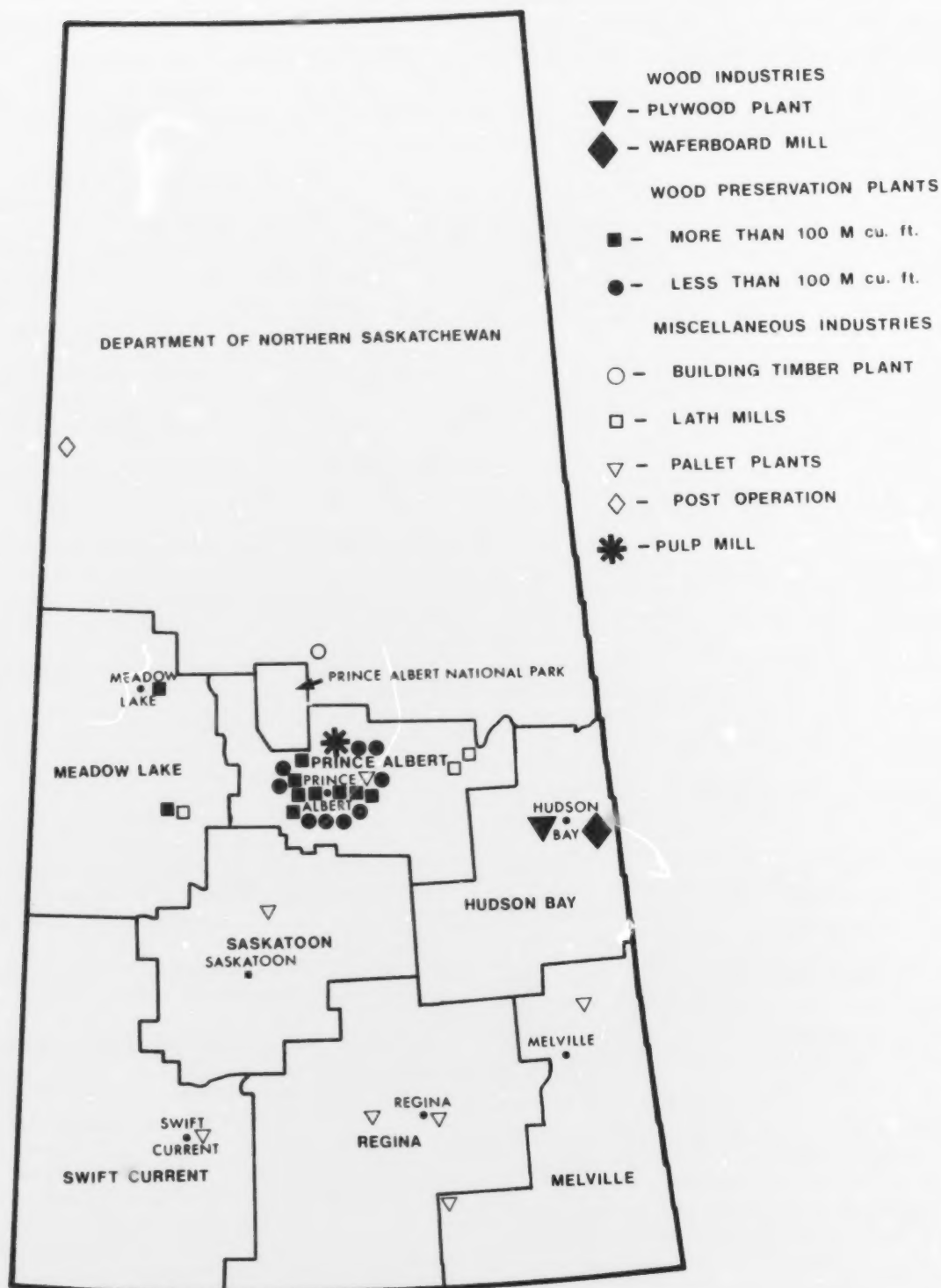


Figure 3. Distribution of other primary wood-using industries, 1979-80.

Table 2. Sample size of forest industry groups surveyed in Saskatchewan, 1979-80

Industry group	Total no. of firms	% of firms	% interview completion
Sawmills			
5 MM fbm and over	6	1.9	100
1 MM to 5 MM fbm	5	1.6	100
100 M to 1 MM fbm	60	19.0	100
Less than 100 M fbm	200	63.3	100
Independent planing mills	11	3.5	100
Plywood	1	0.3	100
Wood preservation	19	6.0	100
Miscellaneous			
Building logs	1	0.3	100
Pallets	7	2.3	100
Laths	3	0.9	100
Posts and poles	1	0.3	100
Waferboard	1	0.3	100
Pulp mill	1	0.3	100
Independent log producers	—	—	—
Total	316	100.0	

All personnel received instructions on the interpretation of questionnaires, techniques of conducting personal and telephone interviews, and rationale for completing the questionnaires on the specified forms.

The Central Forest Products Association and the Saskatchewan Forestry Division were most helpful in conveying the purpose of the study to forestry firms and in locating remote operations.

Analytical Procedures

In those questionnaires where inconsistencies were identified, follow-up calls were made to verify responses. After final auditing of individual questionnaires, relevant variables were totaled by industry group, by region, or by a combination of industry and region. Estimates based on mean values were used to account for missing entries in individual questionnaires. In situations where responses were universally inadequate, secondary data sources

such as Statistics Canada were used to supplement survey data. Totals and averages for industry groups were again examined for consistency to ensure accuracy.

Sawmills were divided into the following four groups according to their production in 1979:

- (i) large sawmills, output equal to or exceeding 5 MM fbm;
- (ii) medium, output between 1 MM and 5 MM fbm;
- (iii) small, output between 100 M and 1 MM fbm; and
- (iv) output less than 100 M fbm, also classified as small.

All information pertaining to the forest resource and forest industry in this report is presented in Imperial units as the industry has yet to convert to metric standards. Metric conversion values are provided in Appendix 2.

CHAPTER II

THE FOREST INDUSTRY OF SASKATCHEWAN: A PERSPECTIVE

Historical Development Of The Forest Industry

The area now known as Saskatchewan was controlled by the Hudson's Bay Company during the initial period of European influence. Under the company's administration, commercial resource extraction was limited to hunting and trapping. In 1870 the company's territories were transferred to Canada and the federal government assumed control of the region's natural resources.

The province of Saskatchewan was formed in 1905, but control of the province's public lands and natural resources was retained by the federal government. In 1930 jurisdiction over natural resources was transferred to the province by constitutional amendment.

In 1931, the Legislature of Saskatchewan enacted the *Forest Act*, which authorized the Department of Natural Resources to administer and manage the province's forests. Currently the *Forest Act* and regulations made under it are administered by the Forestry Division of the Department of Parks and Renewable Resources.

The beginning of commercial utilization of Saskatchewan's forest resource can be traced to 1872. The *Dominion Lands Act* of 1872 designated special forest reserves that were set aside as commercial forest zones (Kabzems et al. 1972). These areas were made available to commercial loggers under lease arrangements. The first major expansion of the industry occurred in the early 1900s with the construction of four large stationary sawmills at Big River, Crooked River, Prairie River, and Prince Albert (Hewett 1973). In addition, The Pas Lumber Co. (located at The Pas, Manitoba) depended on Saskatchewan timber for most of its roundwood supply. This increased sawmill and logging activity coincided with the period of peak settlement and homestead activity in Saskatchewan (1897-1920). In 1912 more than 157 MM fbm of lumber was processed. Saskatchewan led the prairie provinces in terms of total amount of lumber cut by a substantial margin (Table 3). In 1913 sawmill activity began to decline and by the start of the depression (1930-31) annual lumber production had fallen to around 27 MM fbm.

Heavy overcutting of economically accessible timber and devastating forest fires, combined with a softened demand for lumber after the peak settlement period, resulted in the eventual closing of the large

stationary sawmill operations (Hewett 1973). The big mills were replaced by a large number of small, portable sawmills utilizing scattered tracts of timber (Teskey and Smyth 1975b). The contribution of these small operations is reflected in Table 4. The majority of Saskatchewan's lumber production in 1933-34 was produced in sawmills with daily shift capacities of less than 10 M fbm. In Alberta and Manitoba on the other hand, the majority of each province's annual production was produced in sawmills with capacities of 25 M fbm per shift and greater. By 1980 the pattern was reversed and the majority of the lumber production in Saskatchewan's sawmill industry had shifted back to the large mills (Table 5).

The level and pattern of the harvest from provincial crown lands between 1930 and the present are shown in Table 6. These data, which have been obtained from various annual reports of the Saskatchewan Department of Natural Resources and the Department of Tourism and Renewable Resources, show the annual harvest has generally increased over this 50-year period, though periodic fluctuations in the trend have occurred. The annual harvest from provincial lands increased in the 50-year period from 1930 to 1980; however, the annual rate of change was not stable. The annual harvest increased to a level of 47 992 M cu. ft. in 1945, but declined to 21 440 M cu. ft. in 1960. By 1980 the annual harvest climbed to a level of 121 197 M cu. ft.

The reason for the sharp decline after 1945 is described by Hewett (1973, p. 239) as follows:

World War II saw heavy overcutting of the accessible saw timber stands of the province. In 1946, C.R. Christie and A.O. Aschim prepared a revised cutting plan. Allowable cuts were drastically reduced and all white spruce stands, including those in company timber berths, were selectively marked to a 14-inch dbh (diameter at breast height) limit.

Not only has the level of harvesting fluctuated, but the pattern of the cut has changed. The data in Table 6 show that in the early 1930s, the majority of the province's annual harvest was utilized for miscellaneous products such as ties, lath, firewood, and poles. Only 15% of the cut was for sawlogs and less than 1% was

Table 3. Annual lumber production in the prairie provinces, 1908-1930, in M fbm^a

Year	Manitoba	Saskatchewan	Alberta
1908	56 447	91 166	42 382
1909	59 861	87 340	52 850
1910	42 922	75 931	45 127
1911	b	b	b
1912	39 535	157 255	47 478
1913	71 961	114 800	44 462
1914	44 658	56 677	45 236
1915	42 357	62 864	17 975
1916	57 711	84 275	18 350
1930	b	27 390	b

^a Sources: Ross 1909; Macmillan and Gutches 1909; Macmillan 1911a, b; Lewis, 1915, 1916; Government of Saskatchewan 1947.

^b Data not available.

Table 4. Production in Manitoba, Saskatchewan, and Alberta by size of sawmill, 1933-34^a

Mill class (capacity per 10-hr shift)	Manitoba			Saskatchewan			Alberta		
	No. mills	Production (M fbm)	%	No. mills	Production (M fbm)	%	No. mills	Production (M fbm)	%
25 M fbm and over	3	23 604	65	2	8 000	21	9	33 806	52
10 M to 25 M fbm	3	1 689	5	10	6 296	16	47	14 918	23
Less than 10 M fbm	143	10 707	30	260	23 704	63	261	16 276	25
Total	149	36 000	100	272	38 000	100	317	65 000	100

^a Source: Harrison 1936.

Table 5. Production of the Saskatchewan sawmill industry, 1979-80

Annual output	No. of mills	Production (M fbm)	Share of production (%)
5 MM fbm and over	6	185 318	85
1 MM to 5 MM fbm	5	9 641	4
Less than 1 MM fbm	260	23 032	11
Total	271	217 991	100

Table 6. Distribution of the harvest from provincial crown lands, 1930-1982

Year ^a	Sawlog		Pulpwood		Other ^b		Total harvest ('000 cu. ft.)
	('000 cu. ft.)	%	('000 cu. ft.)	%	('000 cu. ft.)	%	
1930	4 565	15	301	1	25 935	84	30 801
1935	16 599	49	54	— ^c	17 236	51	33 889
1940	24 783	53	2 229	5	19 513	42	46 525
1945	28 747	60	7 725	16	11 520	24	47 992
1950	19 290	58	8 592	26	5 389	16	33 271
1955	13 687	60	3 658	16	5 515	24	22 860
1960	15 656	73	2 038	9	3 746	18	21 440
1965	15 612	50	10 656	34	4 903	16	31 171
1970	17 470	20	59 926	70	8 493	10	85 889
1975	29 043	33	55 155	62 ^d	4 618	5	88 816
1980	43 388	36	72 112	60 ^d	5 697	4	121 197
1981	31 229	31	62 657	63 ^d	5 569	6	99 455
1982	35 170	39	47 926	53 ^d	8 018	8	91 114

^a Fiscal year, i.e., April 1 to March 31 for the year indicated.

^b Includes lath, ties, piling, building logs, fence posts, rails, fuelwood, telephone and power poles, small trees, and plywood peelers.

^c Value less than 1%.

^d Includes plywood peelers.

pulpwood. Through time, the proportion of the total annual cut allocated for miscellaneous products has declined and sawlogs and pulpwood have accounted for increasing proportions of the total cut. In 1960 sawlogs accounted for 73% of the total harvest, pulpwood for 9%, and miscellaneous products for 18%.

In 1968, construction of the Prince Albert Pulp Co. Ltd. bleached sulfate pulp mill was completed. The opening of the mill had profound effects on the utilization of Saskatchewan's forested lands. In 1965, when the total cut was 31 171 M cu. ft., the proportions of the total cut in sawlogs and pulpwood were 50% and 34%, respectively. By 1970, the total cut increased to 85 889 M cu. ft. and the corresponding proportions were 20% and 70%.

The development of forest management and utilization in Saskatchewan since 1930 has occurred in three distinct stages. The period between 1930 and 1945 was characterized by a very casual attitude toward forest husbandry and resource conservation. Influences such as land clearing, stand conversion from softwood to hardwood, uncontrolled fires, and heavy overcutting prior to and during World War II combined to produce a situation where the future existence of a viable forest industry was threatened.

In 1945, a Royal Commission on Forestry was appointed to address forest resource and forest industry matters in Saskatchewan. The commission identified the problems and outlined a number of recommendations, including development of a more effective fire protection system, preparation of a comprehensive inventory, intensification of silvicultural activities, and acquisition of trained personnel.

During the second stage of management development (1945-1965), the recommendations of the Royal Commission began to be implemented. Also, the Saskatchewan Timber Board was formed to serve as a marketing agency for the small bush sawmills that still dominated the industry. As noted earlier, harvesting levels declined markedly during this period (Table 6).

The third stage (1965-1981) began with the adoption of the Forest Act of 1965. This act provided new and revised legislative authority for the development of a provincial forest administration. This stage was also

marked by growth and structural change in the forest industry. Processing facilities became larger and more centralized in larger communities and an overall increase in the level of harvesting occurred. These trends had begun in 1961 with the construction of the Wizewood Ltd. (now MacMillan Bloedel Ltd.) waferboard plant at Hudson Bay and were reinforced by the construction of the pulp mill at Prince Albert. In the sawmill industry, the small bush mills were replaced by large, centrally located facilities such as Simpson Timber Co. (Saskatchewan) Ltd. at Hudson Bay and Meadow Lake Sawmill Co. Ltd. at Meadow Lake, which commenced operations in 1965 and 1972, respectively. Also during this period the Saskatchewan Timber Board became Saskatchewan Forest Products Ltd. (SFPL)⁵. SFPL constructed a plywood mill at Hudson Bay (1973), large sawmills at Big River (1975) and Carrot River (1975), and a large wood preservation plant at Prince Albert (1976).

The Forest Industry

The forest industry in Saskatchewan is comprised of a number of component industry groups, each producing a distinct product. These industry groups include the sawmill and planing mill, plywood, wood preservation, miscellaneous⁶, waferboard, and pulp industries.

Sawmill and planing mill industry group

Saskatchewan's sawmill and planing mill industry group was comprised of 271 mills that produced over 233 MM fbm of lumber in 1979-80. This production was, however, not distributed evenly among all sawmills and planing mills. There was also a great diversity in certain technological features among the firms. For this reason single averages of the industry group are not representative. To accommodate this diversity, sawmills were categorized into four separate size classes for this study, and independent planing mills have been considered separately⁷. This section considers a number of different aspects of the Saskatchewan sawmill industry, including concentration of production, planing capability, ownership, length of ownership, average age of equipment, portability, and type of equipment utilized.

The Saskatchewan sawmill industry was quite concentrated, with 2% (six mills) of the mills accounting for 85% of total production in 1979-80 (Table 7). Although the large mills accounted for a very large

⁵ Now the Saskatchewan Forest Products Corporation (SFPC).

⁶ Products include pallets, building timber, lath, posts, and poles.

⁷ Independent planing mills either purchase rough lumber from other sawmills or custom-plane lumber.

Table 7. Concentration of production in the sawmill industry in 1972^a and 1979

1972			1979		
Cumulative number of mills	Cumulative % of mills	Cumulative % of total production	Cumulative number of mills	Cumulative % of mills	Cumulative % of total production
3	1	85	2	1	57
9	3	90	6	2	85
24	8	95	10	4	89
111	35	98	70	26	97
361	100	100	271	100	100

^a Source: Teskey and Smyth 1975b.

proportion of the production, small sawmills did play an important role in local economies. The revenues generated by these small mills were an important source of primary and supplementary income for both full-time and part-time independent operators. They also provided an important source of low-cost lumber in local economies and utilized isolated tracts of timber that were uneconomical for larger operators.

An important feature of the sawmill industry was the number of mills with planing facilities (Table 8). Most of Saskatchewan's large and medium sawmills maintained planing facilities. The number of small sawmills with planing facilities, however, were in the minority. This difference between large and small sawmills is the result of the type of market each mill class serves. The majority of the production in the small mill classes was consumed in local markets while production from the larger mills was generally intended for the larger urban, out-of-province, and foreign markets. Information on markets for Saskatchewan's forest products is provided in greater detail in Chapter VI.

A significant feature of the Saskatchewan sawmill industry was the relative importance of government ownership in the larger sawmill classes. Eight of the large and medium sawmills were owned by the provincial government (Table 9). Single proprietorship predominated in the smaller sawmill classes, accounting for 66% of small mills in the 100 M to 1 MM fbm size class and 90% of sawmills in the less than 100 M fbm annual production class. Partnership accounted for 33% and 9% of these mill classes respectively. Eight of the independent planing mills were operated as single proprietorships. There was also one partnership, one limited

liability company, and one government-owned independent planing mill.

Length of ownership varied greatly in the sawmill and planing mill industry group. The average length of ownership for large mills was 16 years (Table 10). The average length of ownership for medium mills was 2 years, reflecting the 1977 government purchase of four of the mills in this class. Length of ownership in the independent planing mills averaged 16 years.

The age of the capital stock employed in processing reflects in many ways an industry's degree of innovativeness and its ability to respond to competitive forces. This is clearly illustrated in the Saskatchewan sawmill and planing mill industry group. In large sawmills the average age of equipment was about 7 years (Table 10). The low average age of equipment reflects the need for maintaining a modern capital stock in order to compete in the continental market. The average age of equipment in sawmills in the three smallest mill classes and among the independent planing mills ranged from 18 to 24 years.

Portability of processing equipment is a feature that was particularly notable among small sawmills and independent planing mills. There were no portable mills in the large and medium mill classes (Table 11), 67% of the small mills producing 100 M to 1 MM fbm, 52% of the mills producing less than 100 M fbm, and 73% of independent planing mills were portable.

The distribution of lumber-processing equipment in large sawmills in Saskatchewan in 1973 and 1979 is shown in Table 12. There were no apparent shifts in the proportion of mills with particular types of equipment

Table 8. Number of sawmills with associated facilities by size class, 1979-80

Annual output	No. of sawmills with planer	No. of sawmills without planer	Total no. of sawmills
5 MM fbm and over	5	1	6
1 MM to 5 MM fbm	3	2	5
100 M to 1 MM fbm	21	39	60
Less than 100 M fbm	28	172	200
Total	57	214	271

Table 9. Type of ownership by forest industry group, 1979-80

Industry group	Single proprietorship	Partnership	Government or service group ^a	Limited liability companies		
				Provincial	National	Foreign-owned
Sawmills						
5 MM fbm and over	0	0	4	1	0	1
1 MM to 5 MM fbm	1	0	4	0	0	0
100 M to 1 MM fbm	40	20	0	0	0	0
Less than 100 M fbm	182	17	1	0	0	0
Independent planing mills	8	1	1	1	0	0
Plywood	0	0	1	0	0	0
Wood preservation	7	1	1	10	0	0
Miscellaneous	0	1	5	6	0	0
Waferboard	0	0	0	0	1	0
Pulp	0	0	1	0	0	0
Total	238	40	18	18	1	1

^a Service groups are nonprofit organizations. Government includes crown corporations.

Table 10. Average length of ownership and age of equipment by forest industry group, 1979-80

Industry group	Average length of current ownership (years)	Average age of equipment (years)
Sawmills		
5 MM fbm and over	16.4	6.6
1 MM to 5 MM fbm	2.0	20.8
100 M to 1 MM fbm	8.5	18.0
Less than 100 M fbm	IR	21.6
Independent planing mills	16.4	24.0
Plywood	6.0	6.0
Wood preservation	8.2	12.1
Miscellaneous	1.0	7.4
Waterboard	14.0	20.0
Pulp	11.0 ^a	11.0

^a In December 1980, the Government of Saskatchewan assumed full ownership and control of the pulp mill. The provincial government had previously been a minority shareholder.

IR Insufficient response.

Table 11. Number of portable and stationary sawmills and planing mills, 1979-80

Industry group	Number of stationary mills	Number of portable mills
Sawmills		
5 MM fbm and over	6	0
1 MM to 5 MM fbm	5	0
100 M to 1 MM fbm	20	40
Less than 100 M fbm	96	104
Independent planing mills	3	8

Table 12. Distribution of lumber processing equipment in large sawmills in 1973^a and 1979

Facility	1973 Mills ^b			1979 Mills ^b					
	1	2	3	1	2	3	4	5	6
Debarker	2	1	4	0	1	2	1	1	4
Cut-off saw	0	0	0	0	1	1	1	1	0
Circular head saw	0	1	0	1	1	0	0	0	0
Scrag, band, quad, or gang saw	1	1	2	0	1	1	1	1	0
Chip-N-Saw, chipping canter	1	0	1	0	0	1	1	1	3
Reman or resaw	0	0	0	1	1	1	0	1	0
Edger and trimmer	0	2	0	2	2	1	1	1	2
Chipper	1	1	0	0	1	0	1	1	0
Chipping edger	0	0	0	0	0	0	0	0	0
Planer	1	0	1	0	2	1	1	1	2
Dry kiln	2	0	5	0	0	2	1	1	5

^a Source: Teskey and Smyth 1974.

^b Mills 1, 2, and 3 in 1973 don't necessarily correspond to mills 1, 2, 3, 4, or 5 in 1979.

during the 6-year period between 1973 and 1979. In 1979, mills with Chip-N-Saw or chipping-canter sawing facilities accounted for 94% of the total production of large mills.

Wood preservation industry group

Of the 19 plants within the wood preservation industry group, 10 produced more than 100 M cu. ft. per year and the remaining nine produced less than that total. In 1979-80, production in all mills totaled more than 4.3 million cu. ft. The three largest plants accounted for 64% of total production (Table 13). The nine mills producing less than 100 M cu. ft. per year accounted for 7% of the industry's total output.

Table 14 shows the type of processing equipment used by preserving plants producing more than 100 M cu. ft. per year. Pressure-treating cylinders were the preferred equipment type, with seven plants using pressurized cylinders and only four plants using open treating tanks.

Just over half of the firms in the wood preservation industry group were limited liability companies and one third were single proprietorships (Table 9). The average

length of ownership was 8.2 years and the average age of equipment was 12.1 years (Table 10).

Miscellaneous wood-using industry group

The 12 plants in this industry group produced a wide variety of products including house logs, lath, pallets, and untreated posts. Six of the mills were limited liability companies and five were owned and operated by either government or nonprofit organizations (Table 9). There was also one partnership. The nonprofit groups generated a total of 93 person-years of employment for physically and mentally handicapped persons.

Pulp, waferboard, and plywood industry group

The Prince Albert pulp mill is the largest kraft pulp producer as well as the largest industrial enterprise in the forest industry in the prairie provinces. The employment involved in combined logging and milling activities accounted for 29% of Saskatchewan's primary wood-using industry employment and 8% of primary wood-using industry employment in all three prairie provinces combined in 1979-80. The mill, constructed in 1968, is owned by the Prince Albert Pulp Company Ltd. (PAPCO). Initially, Parsons and Whittmore (New York)

Table 13. Concentration of production in the wood preservation industry group, 1979-80

Cumulative number of plants	Cumulative % of plants	Cumulative % of production
1	5	35
3	16	64
5	26	77
10	53	93
19	100	100

Table 14. Type of wood preservation equipment used in preservation plants producing more than 100 M cu. ft. per year, 1979-80

Equipment type	Mills									
	1	2	3	4	5	6	7	8	9	10
Post peeler	2	1	2	2	2	1	3	1	3	2
Sharpener	2	1	2	1	2	1	0	2	0	2
Open preservation tank	1	0	0	0	0	1	0	0	1	1
Pressure treating tank	1	1	1	1	1	0	2	1	0	0
Domer	0	0	0	0	2	0	0	0	0	0

held a 70% ownership position with the remaining 30% held by the Government of Saskatchewan. In 1981 the Government of Saskatchewan purchased the Parsons and Whittmore interests and assumed full ownership and control of PAPCO.

An important feature of PAPCO is the high quality of its final product (bleached sulfate softwood pulp). The pulp produced by this mill is considered to be among the best in the world. The combination of species (jack pine, black spruce, and white spruce) and climate (short growing season with long daylight periods) results in a long-fiber raw material. The pulp produced from these fibers is world-renowned for its strength and brightness. The high-quality product combined with an effective marketing strategy has allowed the enterprise to maintain its market share in spite of some cost disadvantages.

The province's only waferboard mill is located at Hudson Bay. This mill was constructed in 1959 and was purchased by MacMillan Bloedel Industries Ltd. in 1965. The mill is distinctive in that it is the largest

industrial user of hardwood in Canada west of Thunder Bay, Ontario. In 1979-80, 86% of total wood input consisted of trembling aspen and the remaining 14% was black or balsam poplar. The mill processed around 12 MM cu. ft. of roundwood in 1979-80.

The province's only plywood mill is also located at Hudson Bay. This mill was constructed in 1973 by Saskatchewan Forest Products Ltd. The mill is an important component in the province's forestry scene as its presence allows for improved utilization of Saskatchewan's forest resource. Almost 90% of the wood inputs for the plywood mill were purchased from Simpson Timber (Sask.) Ltd. (located at Hudson Bay) in 1979-80. The plywood mill provided a market for the high-value peeler logs harvested from Simpson's forest management license agreement area.

Forest Industry Integration

Integration in the Saskatchewan forest industry takes three forms: vertical, horizontal, and conglom-

erate. Vertically integrated firms are operations that "perform successive phases of the same overall production process" (Thompson 1973). For example, in the sawmill industry group a vertically integrated firm is one that logs, rough-saws, planes, and markets the final product. In the pulp industry group a vertically integrated firm would log, produce pulp, convert the pulp into a final product, and market the product.

Horizontally integrated firms are multiplant enterprises that own and manage a number of geographically distinct plants, each producing a similar product. In the sawmill industry group a horizontally integrated firm would own and manage a number of independently operated sawmills.

Conglomerates are multiplant enterprises where each plant produces a different product. For example, a particular firm may produce a variety of diverse products (e.g., pulp and lumber) where a separate production process and plant are required for each product.

Vertical integration in the Saskatchewan forest industry is shown in Table 15. In all industry groups except the miscellaneous industry group, a minority of operations carry out single phases of the overall manufacturing process and most are vertically integrated to some degree. Horizontally integrated and conglomerated firms are shown in Tables 16 and 17.

Table 15. Vertical integration^a of forest industry groups, 1979-80

	Logging, sawing, & planing	Logging & sawing	Sawing & planing	Sawing only	Total
Sawmills	Number of mills				
5 MM fbm and over	2	1	3	0	6
1 MM to 5 MM fbm	3	2	0	0	5
100 M to 1 MM fbm	16	32	2	10	60
Less than 100 M fbm	26	157	2	15	200
Total	47	192	7	25	271
Plywood	Logging veneer, & plywood	Veneer & plywood	Plywood only	Total	
Total	0	1	0	1	
Wood preservation	Logging, sawing, & preserving	Logging & preserving	Sawing & preserving	Preserving only	Total
More than 100 M cu. ft.	1	4	0	5	10
Less than 100 M cu. ft.	3	3	0	3	9
Total	4	7	0	8	19
Miscellaneous	Logging & processing	Processing only	Total		
Pallet plants	0	7	7		
Lath mills	3	0	3		
Building timber	1	0	1		
Posts producer	1	0	1		
Total	5	7	12		
Waferboard	Logging & processing	Processing only	Total		
Total	1	0	1		
Pulp mill	Logging & processing	Processing only	Total		
Total	1	0	1		

^a Many of the firms considered vertically integrated (with respect to logging) utilized contractors for either parts or all of their logging operations.

**Table 16. Major horizontally integrated firms,
1979-80**

Department of Northern Saskatchewan
Sawmill at Green Lake
Sawmill at Buffalo Narrows
Sawmill at Cumberland House
Sawmill at La Ronge
Sawmill at Weyakwin
Saskatchewan Forest Products Corporation
Sawmill at Big River
Sawmill at Carrot River
Saskatchewan Council for Crippled Children and Adults
Pallet plant at Regina
Pallet plant at Saskatoon
Pallet plant at Yorkton

**Table 17. Conglomerates by ownership and
industry group, 1979-80**

Prince Albert Pulp Company Ltd.
Pulp mill at Prince Albert
Sawmill at Meadow Lake
Saskatchewan Forest Products Corporation
Two sawmills (Big River, Carrot River)
Wood preservation plant at Prince Albert
Plywood mill at Hudson Bay
Department of Northern Saskatchewan
Five sawmills (Green Lake, Buffalo Narrows, Cumberland House, La Ronge, and Weyakwin)
Independent planing mill at Meadow Lake
Building timber plant at Weyakwin
L and M Wood Products Ltd.
Sawmill at Glaslyn
Wood preservation plant at Glaslyn

CHAPTER III

CAPITAL IN THE FOREST INDUSTRY

This chapter describes the nature and role of capital, one of the primary factors of production in the forest industry. Lipsey et al. (1973, pg. 334) define capital as follows:

Capital is a man-made factor of production. The supply of capital in a country (or a firm) consists of the stock of existing machines, plant, equipment, etc. This capital is used up in the course of production, and the stock is thus diminished by the amount that wears out each year. However, the stock of capital is increased each year by the production of new capital goods. Because new capital equipment is rarely the same as the capital it replaces, the nature of society's (or the firm's) stock of capital is constantly changing.

For the purposes of this study, capital is defined as the stock of real, physical, man-made goods that are required for producing forest products. Examples of these physical goods are assorted machinery, buildings, and haul roads.

The Capital Stock In Saskatchewan's Forest Industry

The stock of capital in Saskatchewan's forest industry can be measured on the basis of replacement value or book value. Replacement value is the cost of replacing all machinery, roads, and buildings with similar forms of new capital. This value best represents the absolute differences in the capital stock among firms and among industry groups and is insensitive to differences in age of capital within and among firms. Book value is the depreciated value of the firm's capital stock and is quite sensitive to the age of capital.

In the process of collecting data on the Saskatchewan forest industry, the need for a third measure of capital stock became evident. Many of the small single-proprietorship sawmills did not make use of the sophisticated accounting procedures commonly used among the larger incorporated firms. Also, in many cases the equipment used by these mills had been either completely rebuilt or built entirely from spare parts. As a result, when questioned about replacement and book value, the

operators of these mills could not provide appropriate measures. These operators were, however, very aware of the resale value of their existing equipment, so a third category, market value, was added. Market value measures the resale value of the firm's capital stock. Market value is most closely correlated to book value as it also provides a rough measure of the equipment's remaining service life. Replacement value, book value, and market value for each industry group in the Saskatchewan forest industry are shown in Table 18. A notable feature of the distribution of capital is that 73% of the entire capital stock of the Saskatchewan forest industry (measured by replacement value) is in the Prince Albert Pulp Co. Ltd. pulp mill.

The original NoFRC questionnaire classified capital into six categories: 1) building, plant, and storage facilities; 2) mill machinery and equipment; 3) woodland machinery and equipment; 4) mobile yard equipment; 5) motor vehicles; and 6) haul roads. Because of a lack of response, the proportionate distribution of capital among these categories (Table 19) could only be provided for sawmills, independent planing mills, and the plywood mill. In all types of operation, mill machinery accounts for the largest proportion of total capital. The low proportion of capital in woodlands machinery and equipment is due to the significant amount of timber logged by independent private contractors.

The stock of capital in the Saskatchewan forest industry is constantly changing. Each year a certain proportion of the stock of capital is depleted by use and new capital is added through investment. Annual depletion of the capital stock is measured by depreciation, and annual capital and repair expenditures measure the formation of new capital or repairs to the existing capital stock. Annual depreciation and annual capital and repair expenditures in Saskatchewan's forest industry are shown in Tables 20 and 21.

Financial Aspects Of Capital

Capital in the Saskatchewan forest industry is formed by the investment of private and public funds. Private investors have five principal sources of funds, including personal savings, stocks, bond issues, debt financing, and retained earnings. Government relies on the same five sources with the exception that crown revenues are substituted for private savings.

Table 18. Replacement, book, and market values of the capital stock in Saskatchewan's forest industry, 1979-80

Industry group	Number of firms	Replacement value (\$000)	Book value (\$000)	Market value (\$000)
Sawmills				
5 MM fbm and over	6	56 960	48 620	IR
1 MM to 5 MM fbm	5	3 535	2 164	IR
100 M to 1 MM fbm	60	8 300 ^a	IR	4 192
Less than 100 M fbm	200	15 100 ^a	IR	7 399
Total sawmills	271	83 895	—	—
Independent planing mills	11	901	487	549
Plywood mill	1	15 000	X	X
Wood preservation mills	19	8 640	61 920	6 394
Miscellaneous	12	2 600	1 611	1 647
Waferboard mill	1	40 000	X	X
Pulp mill	1	400 000	X	X
Total all mills	316	551 036	—	—

^a Value is estimated by deriving an average replacement value for one representative mill in each class. The average replacement value is multiplied by the number of mills in the class to derive a total replacement value.

IR Insufficient response.

X Confidential.

Table 19. Distribution of the capital stock in Saskatchewan's forest industry, 1979-80

Industry group	Buildings, plant, and storage	Mill machinery and equipment	Woodland machinery and equipment ^a (%)	Mobile yard equipment	Motor vehicles	Haul roads	Total replacement value (\$000)
Sawmills							
5 MM fbm and over	20	49	5	20	6	0	56 960
1 MM to 5 MM fbm	21	51	14	14	0	0	3 535
100 M to 1 MM fbm	0	46	34	15	5	0	8 300
Less than 100 M fbm	0	85	13	2	0	0	15 100
Independent planing mills	22	51	0	26	1	0	901
Plywood mill	30	63	0	5	2	0	15 000

^a Does not include capital owned by logging contractors.

Table 20. Annual depreciation in the forest industry by industry group and forest section, 1979-80

Industry group	Annual depreciation (\$000)	Forest region	Annual depreciation (\$000)
Sawmills			
5 MM fbm and over	1 932	Dep. of Northern Saskatchewan	261
1 MM to 5 MM fbm	111	Hudson Bay	2 132
100 M to 1 MM fbm	332	Meadow Lake	840
Less than 100 M fbm	302	Melville	X
Total sawmills	2 677	Prince Albert	978a
		Swift Current	29
Independent planing mills	23	Regina	X
Plywood mill	X	Saskatoon	X
Wood preservation mills	187		
Miscellaneous wood-using	X		
Pulp and waferboard	X		
Total	\$4 300a		\$4 300a

^a Value does not include depreciation incurred by Prince Albert Pulp Co. Ltd.
 X - Confidential.

Table 21. Annual capital and repair expenditures for plant machinery and equipment in the Saskatchewan forest industry, 1979-80

Industry group	Capital	Repairs	Forest region	Capital	Repairs
	(\$000)			(\$000)	
Sawmills					
5 MM fbm and over	1 225	1 896	Dep. of Northern Saskatchewan	124	544
1 MM to 5 MM fbm	42	333	Hudson Bay	2 527	2 732
100 M to 1 MM fbm	320	187	Meadow Lake	408	810
Less than 100 M fbm	IR	8	Melville	IR	4
Total sawmills	1 587	2 424	Prince Albert	28 441	75a
			Swift Current	IR	IR
Independent planing mills	IR	54	Regina	IR	IR
Plywood mill	X	X	Saskatoon	IR	IR
Wood preservation mills	8	142			
Miscellaneous wood-using	0	25			
Pulp and waferboard	X	X			
Total	31 500	4 165a		31 500	4 165

^a Value does not include repair expenditures incurred by Prince Albert Pulp Co. Ltd.

X Confidential.

IR Insufficient response.

The debt/equity ratio of a firm will depend on the proportion of investment capital accumulated from each source. Although debt/equity ratios were not obtained for the entire Saskatchewan forest industry, the percentage of total appraised asset value as compared to total outstanding debt for a small cross section of firms was obtained.⁸ Outstanding debt accounted for 7.6% of the asset value of the cross section of firms.

The proportion of a firm's assets in outstanding debt has important implications from the standpoint of the potential return on the firm's equity⁹. Although the return on total capital between two firms may be equivalent, the realized return on the owner's equity may not. The return on equity depends on the debt/equity ratio of the firm and the rate of interest paid on borrowed capital. This concept is termed "gearing" or "leverage", which is defined by Bannock et al. (1978, pg. 198) as follows:

A corporation may borrow capital at fixed interest, and if it can earn more on that capital than it has to pay for it in interest, then the additional earnings accrue to the equity shareholders. A firm with high gearing will be able to pay higher dividends per share than a firm with lower gearing earning exactly the same return on its total capital, provided that return is higher than the rate it pays for loan capital.

Productivity

Productivity is defined by Bannock et al. (1978) as:

A measure of the rate at which output flows from the use of given amounts of factors of production....In practice, productivity is usually measured by expressing output as a ratio to a selected input. The input selected will give its name to the productivity measure, e.g., labour productivity, capital productivity, and land productivity.

Manning and Thornburn (1971) and Sandoe and Wayman (1977) identified a number of determinants of increases in productivity in Canadian forest products

industries. They include innovation of new technologies, work studies leading to improved efficiency, incentive and bonus schemes, industrial training, standardization of techniques, rationalization, economies of scale, profit ability assessment, and more capital-intensive production processes. Some of these affect the productivity of a particular factor of production directly and some indirectly. Each of the causes allows the manager to produce a product by a process that is more technically or economically efficient. For three of these causes of improved productivity (innovation, economies of scale, and capital intensity), the form and quantity of capital are the productivity determining factors.

The quantity and quality of capital employed in production have a direct bearing on the efficiency and competitiveness of the firm. An initial approach to describing the relationships between capital and productivity is to present three separate ratios. They are output per unit of labor (Q/L), output per unit of capital (Q/K), and capital per unit of labor (K/L) (Table 22).

Specific statements about factors contributing to improved productivity among industry groups cannot be made from the information presented in Table 22. The measures are not comparable because products and technologies are nonhomogeneous; the values are simply aggregate representations of each Saskatchewan forest industry group. Table 22 shows that the pulp, plywood, and waferboard group is capital-intensive with over \$354 086 of replacement value capital per employee. This group also produces the most value added per employee (\$78 598). The miscellaneous industry group has both the lowest Q/L and K/L ratios, \$8085 and \$18 440, respectively. There appears, therefore, to be a general relationship between value added produced per employee and capital per employee.

As noted above, the values provided in Table 22 should not be used to describe interindustry differences in factor productivities due to the absence of uniformity of products and technologies among the industry groups. General statements, however, can be made by comparing interregional or temporal ratios for a single industry group producing a relatively homogenous product using relatively similar production methods. These ratios are provided for the sawmill industry group in Table 23, which shows output per unit labor¹⁰ in 1972 to

⁸ The cross section included 9 sawmills and planing mills, 1 wood preservation plant, 1 plywood plant, and 1 miscellaneous mill. The total replacement value of these 12 mills is \$57 million, or about 10% of the total replacement value of all forest industry capital.

⁹ Equity is the residual value after all outstanding liabilities have been deducted from total assets.

¹⁰ Output per unit of labor (Q/L) in Table 23 is measured in terms of board feet (fbm) of lumber produced per sawmill worker (in person-years). The ratio is therefore different than Q/L in Table 22, which shows total value added per person-year (including woodlands employees).

Table 22. Factor productivity indexes and capital-labor ratios by forest industry group, 1979-80

Industry group	Output ^a per unit labor ^b (Q/L) (\$)	Output per unit capital ^c (Q/K) (\$)	Capital per unit labor (K/L) (\$)
Sawmills			
5 MM fbm and over	29 369	299	98 207
1 MM to 5 MM fbm	13 886	346	40 170
100 M to 1 MM fbm	19 336	d	d
Less than 100 M fbm	10 852	d	d
Total sawmills	24 877		
Independent planing mills	31 115	898	34 654
Wood preservation mills	23 649	523	45 236
Miscellaneous	8 085	438	18 440
Pulp, plywood, and waferboard	78 598	222	354 086

^a A unit of output is \$1 worth of value added.

^b A unit of labor is one person-year (company employees only).

^c A unit of capital is equal to \$1000 of replacement capital.

^d The total replacement values indicated in Table 18 are based on the replacement values of a modern mill. Because this technology is not comparable to the actual methods employed by small mills, capital-labor and output-capital ratios are not provided.

1978-79 and 1979-80 for the sawmill industries in Alberta, Saskatchewan, and Manitoba.

Three general observations can be drawn from the data shown in Table 23. First, labor productivity is generally higher in larger mill categories. Second, with the exception of Saskatchewan mills, the current sawmill labor force is more productive than it was in 1972. Third, considerable interregional differences in labor productivity can be observed. As noted earlier, there are a number of possible explanations for these differences. Although each of these causes may have some effect on productivity, increasing returns to scale and the use of technologically improved methods are likely among the more important influences.¹¹

The productivity-improving influence of increasing scale (i.e., increasing returns to scale) in Canadian

sawmills has been documented by Dobie (1973) and Gray (1981).¹² Table 24 shows the unweighted mean sawmill capacities per shift for large sawmills (mills producing greater than 5 MM fbm per year) in each prairie province in 1972 and 1978-79 to 1979-80. Mills in Manitoba and Alberta show an increase in average capacity over the period. This increase corresponds to an increase in Q/L in both provinces (Table 23). This trend to larger average capacity per shift, in association with increased labor productivity, suggests the presence of increasing returns to scale in sawmills in Manitoba and Alberta. Saskatchewan shows the same trend but in reverse. Average sawmill capacity in Saskatchewan declined between 1972 and 1979-80. Associated with this decline is a 6% decrease in average labor productivity over the period.¹³ Thus a relationship between labor productivity and sawmill scale is apparent. This implies the probable existence of increasing returns

¹¹ Returns to scale show the relative increases in physical output associated with a change in inputs. For example, if output more than doubles after all inputs are doubled, then there are increasing returns to scale.

¹² These authors actually describe the related concept of economies of scale, a concept that describes the relative impact on average costs (rather than physical output) of changing scale.

¹³ Smaller (and less productive) sawmills were constructed between 1972 and 1979-80 in Saskatchewan. Job creation rather than profit maximization was the primary factor in the decision to construct these smaller mills.

Table 23. Regional and temporal differences in labor productivity for sawmills on the prairies (1972 to 1978-79, 1979-80)

Region and sawmill group	1972 ^a	1978-79, 1979-80 ^b
	M fbm/person-year ^c	
Alberta		
5 MM fbm and over	320	364
1 MM to 5 MM fbm	168	289
100 M to 1 MM fbm	228	191
Saskatchewan		
5 MM fbm and over	356	334
1 MM to 5 MM fbm	357	112
100 M to 1 MM fbm	332	161
Manitoba		
5 MM fbm and over	232	261
1 MM to 5 MM fbm	233	193
100 M to 1 MM fbm		

^a Sources: Teskey and Smyth 1975a, b, and c.

^b The Alberta ratio is for 1978-79; Saskatchewan and Manitoba ratios are for 1979-80.

^c Person-year is defined as one person working in the sawmill on a year-round basis. This value does not include woodlands employees.

to scale as productivity is higher in larger mills. This analysis, however, lacks the detail required to either confirm the occurrence of increasing returns to scale or to indicate optimal sawmill size.

The productivity improvements shown in Table 23 cannot be solely attributed to increasing returns to scale. Some of the interregional or temporal differences in Q/L ratios occur as the result of the use of improved processing technologies. Sawmill equipment is not the same for all mills. Some mills use circular headsaws while others use band, quad, or gang saws for primary log breakdown. Still other mills utilize the recently developed Chip-N-Saw equipment. This diversity can be observed both through time and in a cross section of mills at one point in time. A recent document entitled *Review of the*

Canadian Forest Products Industry (Department of Industry, Trade and Commerce 1978, pg. 144), describes the impact of technology as follows:

Real output per manhour in sawmills and planing mills grew at an annual rate of 3.5 percent from 1964 to 1976, reflecting the shift in production from small mills to larger, more efficient production units and the increased use of high volume, small-log processing systems in the industry.

In summary, considerable differences in physical output per person-year can be seen in sawmills over time or across regions. In Saskatchewan the productivity of mill labor in large mills decreased by 6% in the period between 1972 and 1979-80. In spite of this decrease, Saskatchewan's large sawmills still had a higher Q/L ratio than Manitoba's large sawmills. Two factors (returns to scale and differing technologies) explain the differences in productivity, but the extent to which productivity differences can be attributed to each of these influences requires further empirical investigation.

Table 24. Average^a shift capacities for sawmills producing greater than 5 MM fbm per year

Region	1972 ^b	1978-79, 1979-80 ^c
	M fbm per shift	
Alberta	66.5	81.0
Saskatchewan	120.7	94.2 ^d
Manitoba	53.7	65.0

^a Averages are unweighted.

^b Source: Teskey and Smyth 1974.

^c The Alberta average is for 1978-79. Saskatchewan and Manitoba averages are for 1979-80.

^d The reason for the decline in average shift capacity is that three mills with relatively low capacities were included in the calculation for Saskatchewan in 1979-80. Two of these mill are crown-owned and the third is integrated with a wood preservation plant.

CHAPTER IV

EMPLOYMENT IMPACT OF THE FOREST INDUSTRY

In 1979-80, the forest industry in Saskatchewan provided direct employment (in terms of full person-years)¹⁴ to 3630 workers. To determine the total employment impact of the industry, however, indirect employment must also be calculated. During the processing of forest products, the forest industry purchases intermediate goods and services from other industrial or retail sectors. As a result, additional production and jobs are generated in these sectors. These jobs are attributable to the initial forest industry activity and are classified as indirect employment. Other sources of indirect employment include the jobs created to satisfy the demands for goods and services generated by forest industry employees.

The purpose of this chapter is to identify both the direct and indirect employment impact of forest industry activity. A number of other characteristics of forest industry employment are also presented, including seasonality of employment, employment status, length of employment, native employment opportunities, organized labor, and the regional distribution of forest industry employment. The final section of the chapter describes the total direct and indirect employment impact of forest industry activity by providing and applying employment multipliers for each industry group.

Employment By Industry Group

The distribution of total forest industry employment by industry group is shown in Table 25. In terms of total employment impact large sawmills dominate, accounting for 32% of total employment. The PAPCO pulp mill accounts for 29% of total forest industry employment. Of the total 3630 jobs created by the forest industry, 56% were located at the processing site and 44% were involved in logging operations. The remainder of this section profiles each industry group with respect to employment impact and seasonal fluctuations in employment levels.

Large sawmills

This group consisted of six firms that operated year-round in 1980. These firms provided about 1172 full-time jobs, representing about 78% of the entire sawmill labor force. Average monthly employment in logging and manufacturing for large mills is illustrated in

Appendix 3, Figure A. Employment in manufacturing held steady throughout the year at about 550 jobs. In contrast, employment in logging operations associated with these mills was highest from November to February, with 1050-1100 workers employed. The logging work force declined markedly to a minimum of 220 workers in April and May, rising slightly to about 300-350 workers in June to September.

Medium sawmills

The five mills in this category accounted for 8% of the total sawmill work force and 3% of the total forest industry employment. Most of the sawmills in the group operated year-round in 1980. Employment for the year averaged 116 workers, peaking at 160 in March and dropping to 100 in June (Appendix 3, Figure B). About 60 workers were employed in woodlands operations from January to April. During May and June logging activity was minimal. Employment in manufacturing was reasonably stable at approximately 80 workers in January, February, and March, increasing slightly to 100 workers from April to September, and dropping back to 80 workers for the remainder of the year.

Small sawmills producing 100 M to 1 MM fbm annually

This sawmill category accounted for 10% and 4% of the total sawmill and forest industry work forces, respectively. Although some of these mills operated year-round, many of them were limited to winter or part-time summer operations. Winter logging employment peaked at 100 workers in February, but the annual average did not exceed 40 workers (Appendix 3, Figure C). Product manufacturing was performed principally in the spring and summer, with peak employment levels of 150 workers in March and April.

Small sawmills producing less than 100 M fbm annually

This category contained the greatest number of sawmills (200), but supported only 4% of total sawmill industry group employment. Milling and logging activities accounted for 40 and 28 person-years of employment, respectively. The majority of the mills in this category were owner-operated and sawmilling was often

¹⁴ A full person-year is defined as one person working 8 hours per day, 5 days per week, 52 weeks per year (or 2080 hours per year).

Table 25. Employment by forest industry group, 1979-80

Industry group	Person-years of employment			% of forest industry
	Woodlands ^a	Mill	Total	
Sawmills				
5 MM fbm and over	632	540	1 172	32
1 MM to 5 MM fbm	30	86	116	3
100 M to 1 MM fbm	40	104	144	4
Less than 100 M fbm	28	40	68	2
Independent planing mills	2	26	28	1
Plywood mills	5	200	205	6
Wood preservation mills	78	178	256	7
Miscellaneous	15	128	143	4
Waferboard	59	266	325	9
Pulp	590	460	1 050	29
Independent log producers	123	N/A	123	3
Total	1 602	2 028	3 630	100

^a Includes employees of contract loggers.

N/A Not applicable.

an activity supplemental to the primary occupation of the entrepreneur. In most cases, production was retained by the operator for his own use or sold in local markets. Monthly employment in this sawmill class fluctuated widely through 1980, with no significant trends apparent (Appendix 3, Figure D).

Independent planing mill industry group

There were 11 independent planing mills operating in 1980. Activities in the majority of these mills remained constant over the course of the year. Twenty-five persons were employed in planing from January to August. This increased slightly to 30 persons from September to December (Appendix 3, Figure E).

Plywood mill

This mill accounted for about 6% of total forest industry employment, and 98% of the 205 person-years

of employment generated by this mill was in the manufacturing plant. Employment in the mill was constant throughout the year at about 200 persons (Appendix 3, Figure F).

Wood preservation industry group

Employment in the wood preservation industry group in 1979-80 was 256 person-years. About 30% of the labor force in this group was employed in logging and the remaining 70% in manufacturing. In the manufacturing portion of wood preservation operations, employment grew from a low of about 115 workers in January to about 200 workers in June and remained at this level through the rest of the year. The peak months for logging were January, February, and March (Appendix 3, Figure G). Logging declined to a minimum in April and peaked again, though at lower levels, in June, July, and August.

Waferboard mill

Employment in the waferboard operation was relatively stable in 1980. Average monthly employment was 59 persons in logging and 266 in manufacturing. Logging did show some decline in April and May but rebounded to previous levels in June (Appendix 3, Figure H). Manufacturing employment was stable throughout the year.

Pulp mill

Employment in the pulp mill was also stable in 1980. Monthly employment averaged 590 persons in logging and 460 in manufacturing throughout the year (Appendix 3, Figure I).

Seasonality Of Employment

As indicated in the previous section, harvesting, skidding, and log-hauling in some industry groups in Saskatchewan are predominantly seasonal activities. Monthly employment levels in logging and manufacturing for the total forest industry are shown in Figure 4. Logging employment was highest during the winter season, with 2200 persons working in January and approximately 2100 in February and March. Logging activity dropped sharply in April during spring breakup and remained at relatively low levels until November. In April and March, approximately 950 persons were employed in logging.

The overall employment level at the processing sites of the industry remained stable throughout 1980. Total monthly employment averaged 2028 workers and ranged from a low of 1800 workers in January to about 2100 workers in June.

Employment Status

The Saskatchewan forest industry depended on logging contractors for a significant proportion of its wood inputs. This is reflected in the proportion of the work force employed by contractors. The distribution of employees between company employees and employees working for logging contractors is shown in Table 26. Contract employees represented 27% of the industry work force and 62% of the woodlands work force. Private contractors provided about 97% and 41% of the woodlands work force in large sawmills and the pulp mill, respectively.

Length Of Employment

The waferboard mill, pulp mill, and independent planing mill industry groups offered the most-secure employment to forest industry workers in 1979-80. Around 80% of the employees in these operations had been with one firm for 5 years or more (Figure 5). The second most secure industry groups were the large sawmill class and the plywood mill. Fifty-five percent of the persons employed in these groups had been with one firm for 5 years or more. The least-stable industry group was the miscellaneous industry group. Much of the employment in this group is provided to handicapped persons, and turnover is high because graduates of the training programs are regularly replaced by new individuals.

Native Employment In The Forest Industry¹⁵

The forest industry in Saskatchewan provides a significant number of employment opportunities for residents of native ancestry. Forestry is a rural activity with processing plants normally located in or close to areas settled by native populations.

In 1979-80, 18% (652 jobs) of the total forest industry labor force was of native ancestry (Table 27); 48% of all native workers were engaged in logging (including transportation of roundwood) and 52% were employed at the primary processing site. The sawmill and planing mill industry groups supported 70% of the native work force, with the wood preservation industry group creating employment for an additional 15%.

On a regional basis the Department of Northern Saskatchewan forest region had the highest degree of native participation in forest industry employment (Table 28); 82% of woodlands and 80% of mill employees in this region were of native ancestry. The Meadow Lake and Prince Albert forest regions also employed significant numbers of natives.

Organized Labor In The Forest Industry

Seventy-six percent of Saskatchewan's forest industry labor force (excluding contractor employees and independent log producer employees) was unionized in 1979-80. In the sawmill industry group, 93% of the company employees working in large sawmills and 92% working in medium mills were represented by unions (Table 29). All company employees in the plywood,

¹⁵ Persons considered to be of native ancestry are status and nonstatus Indians and Metis.

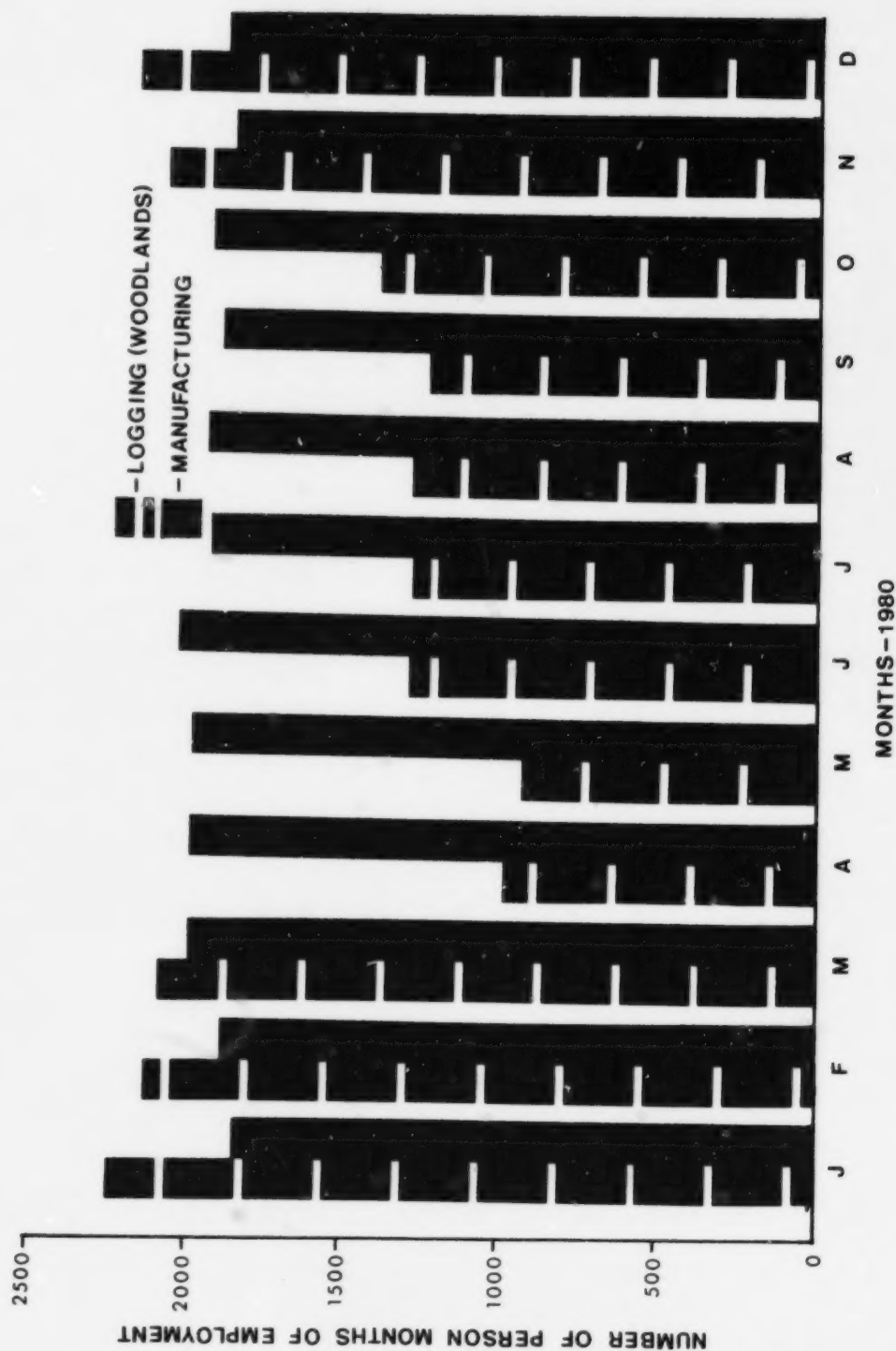


Figure 4. Seasonal changes in the number of workers employed in logging and manufacturing in the forest industry of Saskatchewan, 1979-80.

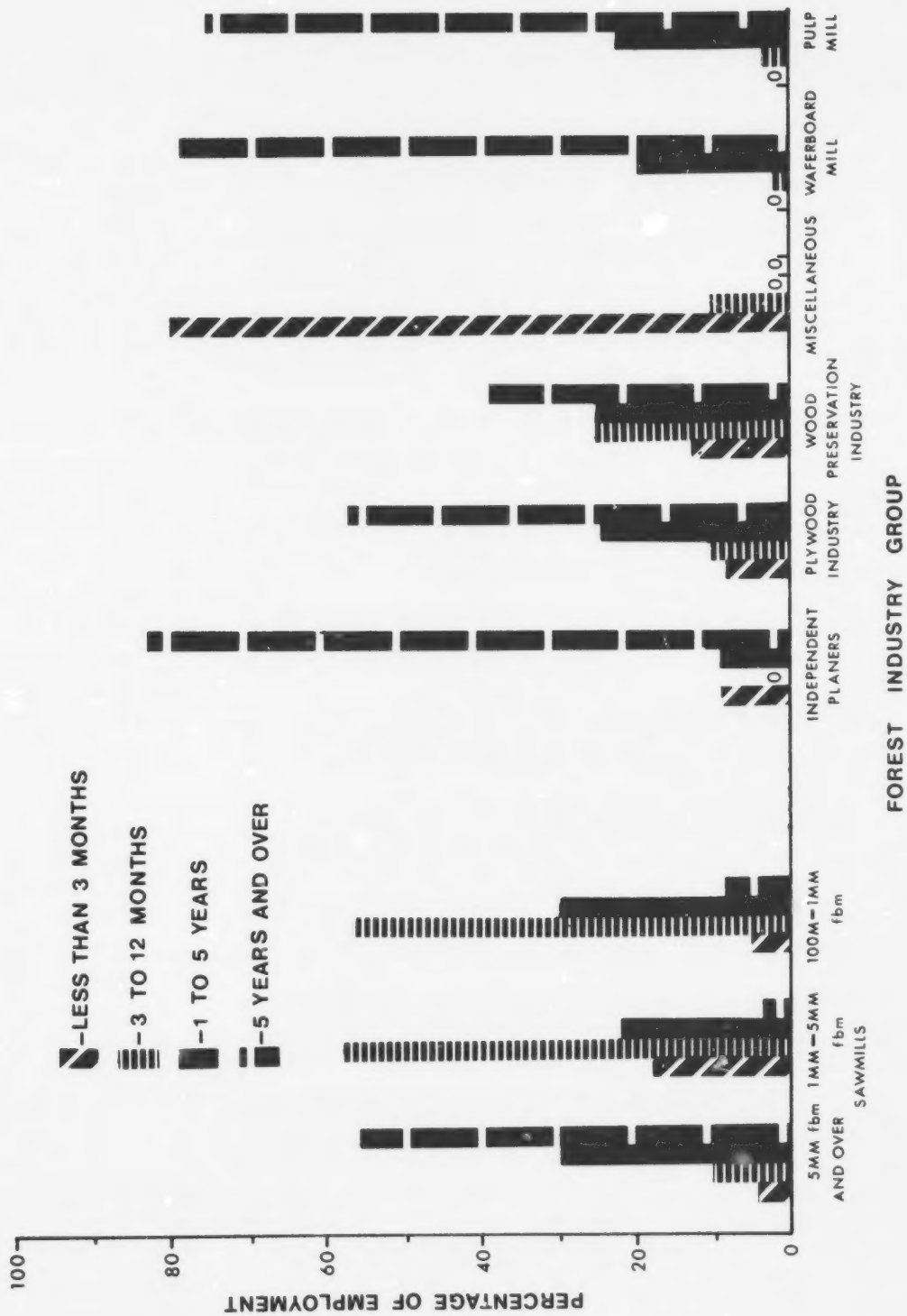


Figure 5. Length of employment by forest industry group, 1979-80.

Table 26. Distribution of employees by affiliation (company or contract) and by forest industry group, 1979-80

Industry group	Number of company employees	Number of contract employees	Total
	(person-years)		
Sawmills			
5 MM fbm and over	580	592	1 172
1 MM to 5 MM fbm	88	28	116
100 M to 1 MM fbm	128	16	144
Less than 100 M fbm	68	0	68
Independent planing mills	26	2	28
Plywood mill	200	5	205
Wood preservation mills	191	65	256
Miscellaneous	141	2	143
Waferboard	275	50	325
Pulp	810	240	1 050
Independent log producers	123	0	123
Total	2 630	1 000	3 630

Table 27. Native employment^a in the forest industry, 1979-80

Industry group	Total industry employment ^b		Native employment			
			Logging		Mill	
	Logging	Mill	No.	% of industry	No.	% of industry
Sawmills						
5 MM fbm and over	655	540	160	24	116	21
1 MM to 5 MM fbm	44	86	35	80	75	87
100 M to 1 MM fbm	45	104	19	42	26	25
Less than 100 M fbm	37	40	1	3	2	5
Independent planing mills	2	26	0	0	18	69
Plywood mill	5	200	0	0	24	12
Wood preservation mills	144	178	53	37	47	26
Miscellaneous	15	128	13	87	8	6
Waferboard	65	266	6	9	5	2
Pulp	590	460	25	4	20	4
Total	1 602	2 028	312	19	340	17

^a In person-years.

^b Includes independent log producers.

Table 28. Native employment by forest region, 1979-80

Forest region	Logging (person-years)	Mill	Total
Department of Northern Saskatchewan	86	123	209
Prince Albert	76	90	166
Meadow Lake	113	83	196
Hudson Bay	34	40	74
Saskatoon	0	0	0
Melville	3	4	7
Regina	0	0	0
Swift Current	0	0	0
Total	312	340	652

Table 29. Organized labor by forest industry group, 1979-80

Industry group	% of company employees unionized	Name of local or association
Sawmills		
5 MM fbm and over	93%	International Woodworkers of America (IWA)
1 MM - 5 MM fbm	92%	Saskatchewan Government Employees Association
Plywood mill	100%	IWA
Waferboard mill	100%	IWA
Pulp mill	100%	Pulp and Paper Workers of Canada

waferboard, and pulp mills were unionized. The International Woodworkers of America represented about 1000 employees and the Pulp and Paper Workers of Canada had a membership of around 800 workers in 1979-80.

Regional Employment Impact Of The Forest Industry

Forest industry employees were not evenly distributed throughout Saskatchewan in 1979-80. The distribution of forest industry workers by forest region is shown in Table 30. The Prince Albert forest region had more employees than any other region, accounting for 49% of total forest industry jobs. The Hudson Bay region was second with 29% of total employment. On a zonal basis, the three central forest regions of Prince Albert, Hudson Bay, and Meadow Lake accounted for 90% of total forest industry jobs. The Department of Northern Saskatchewan accounted for 7% of industry employment and the combined four southern forest regions (Saskatoon, Melville, Regina, and Swift Current) accounted for 3%.

Total Direct And Indirect Employment Impact Of The Forest Industry

As described in the introduction to this chapter, the forest industry is not an isolated component of the Saskatchewan economy. Forest industry activity creates demands for industrial goods and services produced by other sectors of the provincial economy. In addition, incomes paid to forest industry employees increase the economic impact further through local expenditures for household goods and services. The proportion of purchases for locally produced (as opposed to externally produced) goods and services directly influences the indirect impact of forest industry activity.

One way to measure the indirect economic impact of an industrial activity is to quantify the secondary or indirect employment that results from the initial activity. The procedure for determining the secondary employment impact is to derive an employment multiplier.¹⁶ A complete explanation of the various ways that employment multipliers are defined and empirically derived is beyond the scope of this study, however, a general discussion of the concept is necessary.

There are two distinct approaches for the estimation of employment multipliers. These include: a) the "customary economic-base regional multiplier type

(derived by the firm-by-firm method), and b) multipliers originating from a regional input-output framework" (Isard 1960). Employment multipliers derived using the first approach reflect the combination of two unique (although sometimes inseparable) multiplier effects. These effects are defined by Isard (1960) as follows: a) "the first type of multiplier is determined by the extent to which the final export products contain or utilize intermediate products locally manufactured," and b) "the second type of multiplier is the Keynesian-type multiplier dependent on changes in local income flows and determined by the consumption habits of employees of the export industry."

From this definition, two features of economic base employment multiplier effects are apparent. First, the stimulus for the multiplier effect occurs from the sale of goods to markets outside the region (i.e., exports). Second, the size of the multiplier effect is dependent on the degree to which company income and employee income are spent within the boundaries of the regional economy.

Multipliers derived from an input-output framework show the direct and indirect impacts (measured in dollars) of unit increases in final demand in the sector being analyzed. Component categories of final demand include consumption of final goods, government expenditures, investment, inventory additions, and exports. The indirect effect portion of the multiplier is the combined increase in sales of all sectors associated with a one-dollar increase in final demand for the sector in question. This is the linkage effect. The income expenditure patterns of company employees and the resulting indirect effect are accounted for by direct inclusion of the household sector within the structural portions of the input-output model. In order to convert the income-type multipliers (measured in dollar units) to an employment-type multiplier, Isard (1960, p. 627) suggests the following procedure:

- 1) to set down the change in output for each sector from all direct and indirect effects considered,
- 2) through the use of an input-output coefficient which indicates the requirement of man-hours per unit of output to convert the change in output for each sector to change in employment,
- 3) to sum the change in employment over all sectors, and
- 4) to compute the ratio of this sum to the

¹⁶ An employment multiplier is a value that when multiplied by the total direct employment in a given industry indicates the total direct and indirect employment generated by that industry in the region.

Table 30. Employment by forest region, 1979-80

Forest region	Woodlands	Mill	Total	% of total forest industry
	(person-years)			
Department of Northern Saskatchewan	105	154	259	7
Prince Albert	886	873	1 759	49
Meadow Lake	243	193	436	12
Hudson Bay	360	690	1 050	29
Saskatoon	0	32	32	1
Melville	6	44	50	1
Regina	0	38	38	1
Swift Current	2	4	6	0
Total	1 602	2 028	3 630	100

direct employment required to produce that amount of output corresponding to the change in final demand.

As discussed earlier, the empirical determination of specific employment multipliers for the various sectors of the Saskatchewan forest industry has not been done for this study. Multipliers specific to the forest industry in other provinces, however, have been calculated (Table 31). In this report, employment multipliers for selected forest industry groups in Saskatchewan (Table 32) are rounded estimates based on the multipliers provided for other provinces with minor adjustments to reflect Saskatchewan conditions. The resulting multipliers should be viewed only as approximations.

Some basic assumptions pertain to the application of the approximated multipliers. They are as follows: a) that each and every direct job created in the forest sector caused an indirect impact (not just the employment associated with export activity); b) that expendi-

ture patterns of forest industry firms are roughly equivalent between the bench mark regions and Saskatchewan; c) that expenditures of company employees have been included as one of the indirect effects; d) that expenditure patterns of households are equivalent between the bench mark regions and Saskatchewan; e) that the population of the region increases (or decreases) proportionately to increases (or decreases) in the final demand sector of the regional economy; and f) that income expenditure patterns of new members of the population (induced by increases in final demand) are similar to established members of the population.

Table 32 shows the indirect employment resulting from direct forest industry employment by industry group. The average employment multiplier for the aggregate forest industry is estimated to be 2.1. This means that for each job in the Saskatchewan forest industry, 1.1 jobs are created elsewhere in the province's economy. The total employment impact in 1979-80 was 7771 person-years of employment, 3630 being direct and 4141 being indirect.

Table 31. Employment multipliers derived in other studies

Industry group	Estimated multiplier	Location
Logging	1.69 ^a	Ontario
Sawmills and planing mills	2.15 ^a	Ontario
Plywood plants	2.21 ^a	Ontario
Miscellaneous	2.29 ^a	Ontario
Pulp and paper	2.28 ^a	Ontario
Pulp, paper, and allied	2.43 ^b	Prince George, B.C.
Forest industry groups	2.49 ^b	Okanagan, B.C.
Forest industry groups	2.80 ^b	(B.C. province-wide)

^a Source: Ontario Ministry of Natural Resources 1981.

^b Source: F.L.C. Reed and Associates Ltd. 1973.

Table 32. Direct and indirect employment impact by forest industry group, 1979-80.

Industry group	Direct forest industry employment (person-years)	Employment multiplier	Indirect employment (person-years)	Total employment (person-years)
Sawmills				
5 MM fbm and over	1 172	2.0	1 172	2 344
1 MM to 5 MM fbm	116	2.0	116	232
100 M to 1 MM fbm	144	1.5	72	216
Less than 100 M fbm	68	1.5	34	102
Independent planing mills	28	2.0	28	56
Plywood mill	205	2.0	205	410
Wood preservation plants	256	2.0	256	512
Miscellaneous wood-using	143	1.5	72	215
Waferboard mill	325	2.5	488	813
Pulp mill	1 050	2.5	1 575	2 625
Independent log producers	123	2.0	123	246
Total	3 630		4 141	7 771

CHAPTER V

CAPACITY AND PRODUCTION OF THE FOREST INDUSTRY

There were 316 forest industry firms operating in Saskatchewan in 1979-80.¹⁷ The regional distribution of these firms is shown in Table 33.¹⁸ The Prince Albert region had a strong forest industry presence, with 114 firms or 36% of all forest industry establishments. The Hudson Bay and Meadow Lake regions, with 88 and 70 firms, respectively, were two other districts where the forest industry maintained a strong presence. Of the regions within the Commercial Forest Zone, the Department of Northern Saskatchewan contained the fewest firms. The majority of the firms in each of the forest regions in the Commercial Forest Zone were small sawmills (producing less than 1 MM fbm per year).

The distribution of forest industry production is shown in Table 34. The six sawmills in the large category, representing 2% of the sawmill industry group, produced about 85% of the total lumber output. The largest sawmill in Saskatchewan is the Simpson Timber (Sask.) Ltd. mill at Hudson Bay. The large sawmills also produced 78% of the province's marketable wood chip production. The five sawmills in the medium sawmill category produced 4% of the sawmill industry group's total lumber production. The 60 small sawmills producing 100 M to 1 MM fbm annually produced almost 8% of lumber output, while the 200 small firms producing less than 100 M fbm annually accounted for only 3% of total lumber output.

Independent planing mills in Saskatchewan are evenly distributed among the three major regions in the Commercial Forest Zone. Total production by the industry group was 12 728 M fbm. Over 85% of this output was produced by two firms, the Department of Northern Saskatchewan's Meadow Lake planing mill and Pete Zelensky Planing Ltd.

The wood preservation industry group was comprised of 19 firms, 10 producing more than 100 M cu. ft. per year and 9 producing less than 100 M cu. ft. per year. The 10 largest wood preservation plants produced 93% of the industry group's production of treated wood products. A notable feature regarding the regional distribution of the Saskatchewan forest industry is that the majority of wood preservation plants were located in the Prince Albert forest region. Of the 19 plants, 17 were

located within the Prince Albert region.

Three of the most important industrial facilities in Saskatchewan are PAPCO's bleached sulfate kraft pulp mill at Prince Albert, the Saskatchewan Forest Products Corporation plywood mill at Hudson Bay, and the Macmillan Bloedel Industries Ltd. waferboard plant, also located at Hudson Bay. These three mills, along with the Simpson Timber (Sask.) Ltd. sawmill at Hudson Bay, form the backbone of the Saskatchewan forest industry. The diversity of products from these mills allows for improved utilization of Saskatchewan's forest resources and reduces the destabilizing effects caused by an overdependence on single product lines. Also, since the majority of products of these four mills are exported from the province, the direct and indirect employment and incomes are sustaining factors in Saskatchewan's northern economy.

Total production and the regional distribution of forest industry output by product type during 1979-80 is shown in Table 35.

Normal Output And Engineered Capacity

The productive potential or installed capacity of Saskatchewan's forest industry firms at any point in time is directly related to the industry's stock of capital. The stock of capital of a particular firm consists of all buildings, equipment, and machinery used in the production process. The producing capability of a firm depends on the number, size, and type of these capital items and how they are arranged in the production line. Collectively, these capital items and their arrangement are termed the technology of the firm. The installed capacity of the firm is functionally dependent on this technology.

Installed process capacity means "the maximum output obtainable under normal technological and market conditions" (Statistics Canada 1978, p. 6). Process capacity, as opposed to rated machine capacity, defines the production capability of the entire production line. Rated machine capacity relates to the production potential of particular machines (virtually in isolation from integrated components in the production line).

¹⁷ This value does not include independent log producers.

¹⁸ Figures 2 and 3 show the geographic distribution of the Saskatchewan forest industry.

Table 33. Distribution of the Saskatchewan forest industry by forest region, 1979-80

Industry group	Forest region								Total
	Swift Current	Regina	Melville	Saskatoon	Hudson Bay	Meadow Lake	Prince Albert	Department of Northern Saskatchewan	
Sawmills									
5 MM fbm and over	0	0	0	0	1	2	2	1	6
1 MM to 5 MM fbm	0	0	0	0	0	0	1	4	5
100 M to 1 MM fbm	2	0	1	0	11	17	16	13	60
Less than 100 M fbm	5	0	3	0	70	45	72	5	200
Total sawmills	7	0	4	0	82	64	91	23	271
Independent planing mills									
Independent planing mills	0	0	0	0	4	4	3	0	11
Plywood plants	0	0	0	0	1	0	0	0	1
Wood preservation plants	0	0	1	0	0	1	17	0	19
Building logs	0	0	0	0	0	0	0	0	0
Lath mills	0	0	0	0	0	0	0	0	0
Pallet plants	1	2	2	1	0	1	2	3	12
Waferboard mill	0	0	0	0	1	0	0	0	1
Pulp mill	0	0	0	0	0	0	1	0	1
Total	8	2	7	1	88	70	114	26	316

Table 34. Distribution of firms and production by forest industry group, 1979-80

Industry group	Firms		Production (M fbm unless otherwise specified)	Wood chips (BDU) ^a
	(No.)	(%)		
Sawmills				
5 MM fbm and over	6	2	185 318	87 311
1 MM to 5 MM fbm	5	2	9 641	0
100 M to 1 MM fbm	60	19	16 719	0
Less than 100 M fbm	200	63	6 313	0
Total sawmills	271	86	217 991	87 311
Independent planing mills	11	3	12 728	0
Plywood^b	1	b	420 MM sq. ft.	20 000
Wood preservation plants				
More than 100 M cu. ft.	10	3	4 131 M cu. ft.	
Less than 100 M cu. ft.	9	3		
Treated material			305 M cu. ft.	
Lumber (untreated)			26	0
Miscellaneous	12	4		
Waferboard^b	1	b	875 MM sq. ft.	
Pulp	1	b	304 072 tons	
Total	316	99		

^a 1 BDU (bone dry unit) = 2400 lb. of bone dry chips.^b 1/16-in. basis.

Table 35. Output of forest products in 1979-80 by product type and forest region

Product	Dep. North. Saskatchewan	Forest region							Total Production
		Hudson Bay	Meadow Lake	Melville	Prince Albert	Swift Current	Regina	Saskatoon	
Dimension lumber - M fbm	12 769	89 181	42 196	954	56 490	514	0	0	202 104
Boards - M fbm	5 668	10 732	6 407	115	2 552	174	0	0	25 648
Timbers - M fbm	1 347	203	1 192	0	287	14	0	0	3 043
Ties - M fbm	0	0	204	0	540	0	0	0	744
Plywood (1/16-in. basis) - MM sq.ft.	0	420	0	0	0	0	0	0	420
Preserved posts and poles - M cu.ft.	0	0	830	0	3 306	0	0	0	4 136
Preserved lumber - M cu.ft.	0	0	13	0	225	0	0	0	238
Pallets and containers - M fbm	0	0	0	1 600	190	60	1 400	800	4 050
Lath - M fbm	10	0	84	0	79	0	0	0	173
Shakes and shingles - M fbm	0	0	13	0	0	0	0	0	13
Rails - M cu.ft.	213	30	52	0	15	6	0	0	316
Building logs - M fbm	729	0	0	0	14	0	0	0	743
Unpreserved posts and poles - cu.ft.	626	4	92	0	18	0	0	0	740
Waferboard (1/16-in. basis) - MM sq.ft.	0	875	0	0	0	0	0	0	875
Pulp (bleached sulfate) - tons	0	0	0	0	304 072	0	0	0	304 072
Pulpwood - cords	556 300	133 147	70 975	0	36 098	0	0	0	796 520
Firewood - cords	6 336	4 587	2 801	234	6 463	234	234	234	21 123
Plywood cores - cords	0	5 434	0	0	0	0	0	0	5 434
Chips - BDU ^a	0	65 000	23 211	0	19 100	0	0	0	107 311

^a 1 BDU (bone dry unit) = 2400 lb. of bone dry chips.

As previously defined, installed capacity represents the maximum productive capability of the firm, assuming full utilization of the capital stock. Frequently, however, the stock of capital may be less than fully utilized. Statistics Canada (1978, p. 5) states:

The stock of capital in place typically is not used with the same degree of intensity over the year. Recently, increasing attention has been focused on the measurement of productive potential and the extent to which it is realized. This capacity utilization measurement is an interesting way of examining the relationship between the total resources available and the level of potential output.

Capacity utilization rates measure the extent of underutilization of the capital stock and show the "gap between potential and actual use of" the capital stock (Statistics Canada 1978). The primary sources of underutilization are imbalances between demand and installed capacity at given points in time.

Average installed capacity, average normal output, and capacity utilization rates (operating ratios) for the various forest industry groups in Saskatchewan are shown in Table 36. The capacity utilization rates in Table 36 are derived by dividing the average output per shift (or per day) by the average process capacity per shift (or per day).¹⁹ Among the sawmill industry group, the large sawmill class had the highest capacity utilization with average per shift output at 90% of process capacity in 1979-80. Capacity utilization in medium and small sawmills was 24-30% lower than in large sawmills. Planing mills operating as part of a sawmill-planing mill complex generally attained operating ratios from 2 to 5% higher than the sawmill. The reason for this is that the sawmill manager can simply shut down the planer until he has enough rough lumber stockpiled that a shortage of input flows does not prevent the machinery from reaching higher levels of capacity utilization. Although operating rates were generally higher on a per-shift basis for the planing mill part of the complex, the number of shifts in operation was generally lower than with the sawmill equipment.

The wood preservation industry group produced at 74% of process capacity, the lowest capacity utilization in the forest industry. The province's pulp mill averaged 97% of process capacity and the waferboard plant maintained a capacity utilization ratio of 1.01. The province's only plywood plant operated at 97% of capacity in 1979-80.

An additional approach to analyzing capacity in Saskatchewan's forest industry is to indicate factors constraining expansion of the capital stock and consequently process capacity. Constraining factors limiting the expansion of existing forest industry firms are shown in Table 37. The primary constraints for firms in the four forest industry groups were lack of available timber and soft market demand.

Production Of The Sawmill And Planing Mill Industry Group

The 282 sawmills and planing mills operating in 1979-80 produced 230 719 M fbm of lumber, of which 196 491 M fbm (85%) was planed (Table 38). Dimension lumber²⁰ represented the principal product of this industry group, accounting for 88% of all lumber products. Board products and timbers represented 11% and 1%, respectively, of all sawmill products.

Large sawmills produced 80% of the total lumber production, while sawmills producing 100 M to 1 MM fbm per year accounted for 7%. Independent planing mills accounted for 5% of the industry group's total output.

Among dimension lumber products, 2 × 4s predominated, accounting for 61.7% of all dimension lumber produced, while 2 × 6s, 2 × 8s, and 2 × 3s accounted for 21%, 9.3%, and 3.7%, respectively (Table 39). Among board lumber products, 1 × 6s and 1 × 4s accounted for 38.2% and 36.2% of total board production respectively. The primary timber products were 4 × 6s and 4 × 4s, which accounted for 44.2% and 39.9%, respectively, of total timber production.

Spruce was the major species used by the Saskatchewan sawmill industry (Table 40); 81% of the dimension lumber, 82% of boards, and 40% of timber products

¹⁹ A number of alternative methods have been developed for measuring capacity utilization. The Department of Industry, Trade and Commerce employs a procedure called the Wharton School Trend-Through-Peak Estimation Procedure. Statistics Canada capacity utilization measures are based on capital-output ratios (Statistics Canada 1978).

²⁰ Timbers, dimension lumber, and board lumber refer to sawn material of 3-in. or greater, 2-in., and 1-in. thicknesses, respectively. The material can be of any length or width.

Table 36. Engineered capacity, normal output, and capacity utilization ratios by forest industry group, 1979-80

Industry group	Average ^a engineered capacity (per 8-hr. shift)		Average ^a normal output (per 8-hr. shift)		Capacity utilization ratio	
	Sawmill	Planer	Sawmill	Planer	Sawmill	Planer
	(fbm)	(fbm)	(fbm)	(fbm)		
Sawmills						
5 MM fbm and over	105 400	103 750	95 120	93 375	0.90	0.92
1 MM to 5 MM fbm	22 400	48 333	14 700	28 333	0.66	0.59
100 M to 1 MM fbm	16 906	35 000	10 227	22 667	0.60	0.65
Less than 100 M fbm	4 709	IR	3 089	IR	0.66	IR
Independent planing mills	b	42 750	—	30 825	—	0.72
Plywood (1/16-in. basis)	900 M sq. ft.		870 M sq. ft.		0.97	
Wood preservation (mills producing more than 100 M cu. ft.)	2 562 cu. ft.		1 887 cu. ft.		0.74	
Miscellaneous	IR		IR		IR	
Waferboard (1/16-in. basis)	875 M sq. ft.		885 M sq. ft.		1.01	
Pulp	908 tons/day		881 tons/day		0.97	

^a Averages are weighed by mill output.

^b Not applicable.

IR Insufficient response.

Table 37. Factors limiting the operation and expansion of Saskatchewan's forest industries, 1979-80

Industry group	No. of firms	Factor ratings ^a	Limiting factors			
			Availability of timber	Labor shortage	Logging access in summer	Market demands
Sawmills						
5 MM fbm and over	6	Primary	4 ^b		1	1
		Secondary	1			2
1 MM to 5 MM fbm	5	Primary	3			2
		Secondary	1			
Independent planing mills	11	Primary				2
		Secondary		1		
Wood preservation (mills producing more than 100 cu. ft.)	10	Primary	9			

^a Indicates a decreasing order of importance of factors limiting the operation and expansion of the forest industry. Some firms did not give limiting factors.

^b This value represents the number of firms identifying the particular factor as limiting.

Table 38. Rough and planed lumber production from Saskatchewan's sawmill and independent planing mill industry groups, 1979-80

Lumber type	Industry group				Independent planing mills	Total
	Sawmills					
	5 MM fbm and over	1 MM to 5 MM fbm	100 M to 1 MM fbm (M fbm)	Less than 100 M fbm		
Dimension lumber ^a						
Planed	165 346	3 593	2 954	403	7 436	179 732
Rough	4 250	3 702	9 909	4 473	14	22 348
Total	169 596	7 295	12 863	4 876	7 450	202 080
Board lumber ^b						
Planed	9 699	962	581	114	5 068	16 424
Rough	5 081	501	2 494	1 094	4	9 174
Total	14 780	1 463	3 075	1 208	5 072	25 598
Timbers ^c						
Planed	0	75	46	8	206	335
Rough	942	808	735	221	0	2 706
Total	942	883	781	229	206	3 041
Total planed	175 045	4 630	3 581	525	12 710	196 491
Total rough	10 273	5 011	13 138	5 788	18	34 228
Total production	185 318	9 641	16 719	6 313	12 728	230 719

^a Material of 2-in. thickness.

^b Material of 1-in. thickness.

^c Material of 3-in. or over thickness.

Table 39. Saskatchewan sawmill and planing mill lumber production by size class and quality class, 1979-80

Lumber product	Size (in.)	Planed (M fbm)	Rough (M fbm)	% by size	% of all products
Dimension	2 × 2	946	14	0.5	0.4
	2 × 3	7 554	14	3.7	3.3
	2 × 4	118 614	6 105	61.7	54.1
	2 × 6	32 440	10 079	21.0	18.4
	2 × 8	14 846	3 904	9.3	8.1
	2 × 10	4 306	1 931	3.1	2.7
	2 × 12	1 026	300	0.7	0.6
Total		179 732	22 348	100.0	87.6
Boards	1 × 2	0	0	0.0	0.0
	1 × 3	3 780	7	14.8	1.6
	1 × 4	7 025	2 254	36.2	4.0
	1 × 6	4 470	5 305	38.2	4.2
	1 × 8	670	1 344	7.9	0.9
	1 × 10	381	213	2.3	0.3
	1 × 12	98	52	0.6	0.1
Total		16 424	9 174	100.0	11.1
Timbers	4 × 4	124	1 091	39.9	5.3
	4 × 6	152	1 193	44.2	5.8
	6 × 6	31	259	9.5	1.3
	8 × 8	28	163	6.3	0.8
Total		335	2 706	99.9	13.2

Table 40. Species mix of lumber production, 1979-80

Industry group	Product	Total production (M fbm)	Species		
			Spruce (M fbm)	Pine (M fbm)	Poplar (M fbm)
Sawmills					
5 MM fbm and over	Dimension	169 596	139 521	29 909	166
	Boards	14 780	13 381	1 385	14
	Timber	942	142	800	0
1 MM fbm to 5 MM fbm	Dimension	7 295	5 486	1 525	284
	Boards	1 463	629	754	80
	Timber	883	308	100	475
100 M to 1 MM fbm	Dimension	12 863	10 393	1 595	875
	Boards	3 075	2 285	507	283
	Timber	781	447	262	72
Less than 100 M fbm	Dimension	4 876	2 384	873	1 619
	Board	1 208	677	246	285
	Timber	229	123	51	55
Independent planing mills	Dimension	7 450	5 848	1 140	462
	Board	5 072	3 921	1 065	86
	Timber	206	184	13	9
Total sawmills and planing mills	Dimension	202 080	163 632	35 042	3 406
	Board	25 598	20 893	3 957	748
	Timber	3 041	1 204	1 226	611
Total		230 719	185 729	40 225	4 765

were cut from spruce. Pine was the second most important species, accounting for 17% of total lumber output. Two percent of all lumber products were made from poplar.

Except for large sawmills where rail transportation prevailed, lumber transportation was generally by truck (Table 41). The large sawmills moved about 53% of their total lumber production by rail and approximately 47% by truck. Two factors are important for explaining the differences in transportation mode. First, large sawmills usually have a sufficient quantity of lumber to fill rail cars on a continuous basis and second, a large portion of lumber products from large mills are moved long distances to export markets in the United States. Rail transportation is less expensive than truck for long hauls and as a result, rail transport is the preferred mode.

Wood Preservation Industry Group

The 19 plants in this industry group produced 4 374 000 cu. ft. of preservative-treated wood products (Table 42). The nine plants producing greater than 100 M cu. ft. per year accounted for 93% of this production. The predominant method of treatment in these large mills was the use of pressurized cylinders using oil-borne pentachlorophenol or chromated copper arsenates as preservatives. Preservative-treated posts were the dominant product, representing 73% of total production.

Plywood And Waferboard Plant Production

Total production from Saskatchewan's two panel producing plants is shown in Table 43. The waferboard plant at Hudson Bay produced over 154 MM sq. ft.

Table 41. Transportation of lumber products, 1979-80

Industry group	Product	Total production (M fbm)	Mode of transport	
			Truck (M fbm)	Rail (M fbm)
Sawmills				
5 MM fbm and over	Dimension	169 596	78 243	91 353
	Boards	14 780	7 040	7 740
	Timbers	942	942	0
1 MM fbm to 5 MM fbm	Dimension	7 295	7 295	0
	Boards	1 463	1 463	0
	Timbers	883	883	0
100 M to 1 MM fbm	Dimension	12 863	12 863	0
	Boards	3 075	3 075	0
	Timbers	781	781	0
Less than 100 M fbm	Dimension	4 876	4 876	0
	Boards	1 208	1 208	0
	Timbers	229	229	0
Independent planing mills	Dimension	7 450	7 122	328
	Board	5 072	4 610	462
	Timber	206	185	21
Total sawmills and planing mills	Dimension	202 080	110 399	91 681
	Board	25 598	17 396	8 202
	Timber	3 041	3 020	21
Total		230 719	130 815	99 904

(875 MM sq. ft., 1/16-in. basis) in 1979-80. The most popular thicknesses were 1/4-in. and 7/16-in. panels. About 90% of waferboard production is first-grade material.

The plywood plant, also located at Hudson Bay, produced 55 MM sq. ft. (420 MM sq. ft., 1/16-in. basis) in 1979-80. The most popular sheet thicknesses were 3/8-in. and 5/8-in. plywood panels. Sixty percent of the plywood produced in Saskatchewan was "standard sheathing" grade and 40% was the superior "select sheathing" grade.

Pulp Mill Production

As described in Chapter II, the softwood bleached kraft pulp produced by Prince Albert Pulp Co. Ltd. (PAPCO) ranks with the best in the world because of its desirable qualities of strength, lightness, smoothness, and softness. These qualities prevail because of the cool northerly climate and the inherent characteristics of the species used in processing (black spruce, white spruce, and jack pine). Total production by the PAPCO mill in 1979-80 was 304 072 air-dry-tons.

Table 42. Wood preservation industry group production, 1979-80

Mill size	Products			Total production
	Lumber	Posts	Poles	
Greater than 100 M cu. ft.	238	2 909	922	4 069
Less than 100 M cu. ft.	0	305	0	305
Total	238	3 214	922	4 374

Table 43. Plywood industry group and waferboard industry group production, 1979-80

Sheet thickness (in.)	Plywood production		Waferboard production	
	Actual	1/16-in. basis	Actual	1/16-in. basis
	(M sq. ft.)			
1/4	0	0	65 601	262 404
5/16	11 060	55 300	20 993	104 965
3/8	19 333	116 000	16 036	96 216
7/16	0	0	37 487	262 409
1/2	5 525	44 200	2 187	17 496
5/8	13 820	138 200	13 120	131 200
3/4	5 525	66 300	0	0
Total	55 263	420 000	154 424	874 690

CHAPTER VI

MARKETS FOR SASKATCHEWAN'S FOREST PRODUCTS

The products of Saskatchewan's industry were sold in local²¹, provincial, national, and foreign export markets. The majority of Saskatchewan's forest industry products, however, was sold outside the province. The export-base nature of forest industry production is important to the health of the provincial economy because the sale of goods and services to markets outside the province is a most important "engine of growth" in the Saskatchewan economy.

Lumber Markets

In 1979-80, 50% of the total lumber produced in Saskatchewan was sold in the U.S. (Table 44). Local and provincial markets accounted for about 30% of total production. Other Canadian provinces accounted for the remaining 20%.

Large sawmills in Saskatchewan were the major exporters of lumber, sending 63% of their dimension lumber and 48% of their board lumber production to U.S. markets (Table 44). Only 14% of dimension production and 39% of board lumber production by large sawmills was retained in Saskatchewan. Sixty-six percent of timber production was sold in Saskatchewan, with the remaining 34% exported to either Manitoba or Alberta.

Nearly all of the production from medium and small sawmills (i.e., all mills producing less than 5 MM fbm per year) was sold in Saskatchewan in 1979-80; only 80% of the 32 673 M fbm of lumber produced by these mills was shipped from the province. Local markets predominated for small sawmills (i.e., mills producing less than 1 MM fbm per year), and the provincial market was the most important for medium-sized sawmills.

In the independent planing mill industry group, dimension lumber production was approximately evenly distributed among local, provincial, and U.S. markets, with local markets being slightly more important. In contrast, the majority of the boards and timbers produced by this industry group were sold in the provincial market.

Preserved Wood Products Markets

Approximately one-half of the production of preserved posts, poles, and lumber was sold on local and provincial markets (Table 45). The remaining produc-

tion was exported to Alberta, Manitoba, and B.C., which accounted for 32%, 15%, and 1%, respectively, of treated wood production in 1979-80.

Saskatchewan, Alberta, and Manitoba accounted for approximately equal proportions of the 922 M cu. ft. of preserved poles treated in 1979-80. The majority of the 3214 M cu. ft. of preserved posts produced was retained in Saskatchewan. The province of Alberta did, however, import a significant quantity of treated posts (2014 M cu. ft. or 32%). Sales of preserved lumber production was also evenly distributed among Saskatchewan, Manitoba, and Alberta.

Plywood And Waferboard Markets

The proportional distribution of Saskatchewan panel production by market destination in 1979-80 is shown in Table 46. Eighty-four percent of plywood production was sold in the domestic Canadian market. The remaining 16% was shipped overseas to the United Kingdom. Eastern Canada was the major purchaser of Saskatchewan plywood in 1979-80, accounting for 40% of total production. The absence of plywood shipments to U.S. markets reflects the existence of a 15% tariff imposed on Canadian plywood entering the U.S.

The primary market destination for Saskatchewan's waferboard production was the U.S., which accounted for 37% of total production in 1979-80. Forty-seven percent of total production was shipped to other Canadian provinces and the remaining 16% was retained for consumption within Saskatchewan.

Bleached Kraft Pulp Markets

The high-quality of PAPCO's bleached kraft pulp is a major factor contributing to the marketability of the pulp produced at Prince Albert. The markets for PAPCO's bleached kraft pulp are diverse and widespread. The primary market destination in 1979-80 was the midwestern U.S., which accounted for 75% of production. The Pacific Rim (Japan, Korea, and Taiwan) accounted for 15% of production in 1979-80. Purchasers in Mexico accounted for 5% of production and the remaining 5% was distributed to papermills within Canada.

²¹ For the purposes of this report, a local market has been defined as an area within a 50-mile radius of the manufacturing firm.

Table 44. Markets for lumber products, 1979-80

Mill size	Product	Total production (M fbm)	Local		Saskatchewan		Alberta		Manitoba		Ontario and Quebec		United States ^a	
			(M fbm)	(%)	(M fbm)	(%)	(M fbm)	(%)	(M fbm)	(%)	(M fbm)	(%)	(M fbm)	(%)
Sawmills	Dimension Boards Timber	169 596	450	0.3	23 969	14.1	5 667	3.3	21 746	12.8	11 762	6.9	106 002	62.5
		14 780	328	2.2	5 415	36.6	50	0.3	1 428	9.7	472	3.2	7 087	47.9
		942	—	—	622	66.0	120	12.7	200	21.2	—	—	—	—
1 MM fbm to 5 MM fbm	Dimension Boards Timber	7 295	751	10.3	4 939	67.7	—	—	1 547	21.2	58	0.8	—	—
		1 463	435	29.7	827	56.5	—	—	196	13.4	5	0.4	—	—
		883	63	7.1	588	66.6	—	—	232	26.3	—	—	—	—
100 M to 1 MM fbm	Dimension Boards Timber	12 863	8 801	68.4	3 499	27.2	145	1.1	418	3.3	—	—	—	—
		3 075	1 894	61.6	1 123	36.5	—	—	58	1.9	—	—	—	—
		781	545	69.8	236	30.2	—	—	—	—	—	—	—	—
Less than 100 M fbm	Dimension Boards Timber	4 876	4 774	97.9	102	2.1	—	—	—	—	—	—	—	—
		1 208	1 189	98.4	19	1.6	—	—	—	—	—	—	—	—
		229	229	100.0	—	—	—	—	—	—	—	—	—	—
Independent planing mills	Dimension Boards Timber	7 450	2 950	39.6	2 198	29.5	—	—	276	3.7	—	—	2 026	27.2
		5 072	872	17.2	3 206	63.2	—	—	401	7.9	—	—	593	11.7
		206	64	31.1	114	55.1	—	—	14	6.9	—	—	14	6.9
Total sawmills and planing mills	Dimension Boards Timber	202 080	17 726	8.8	34 707	17.2	5 812	2.9	23 987	11.9	11 820	5.8	108 028	53.4
		25 598	4 718	18.4	10 590	41.4	50	0.2	2 083	8.1	477	1.9	7 680	30.0
		3 041	901	29.6	1 560	51.3	120	3.9	446	14.7	—	—	14	0.5
Total		230 719	23 345	10.1	46 857	20.3	5 982	2.6	26 516	11.5	12 297	5.3	115 722	50.1

^a Midwestern and southeastern states.

Table 45. Markets for preserved wood, 1979-80

Product	Total production (M cu. ft.)	Local		Saskatchewan		Alberta		Manitoba		British Columbia	
		(M cu.ft.)	(%)	(M cu.ft.)	(%)	(M cu.ft.)	(%)	(M cu.ft.)	(%)	(M cu.ft.)	(%)
Poles	922	12	1.3	310	33.7	300	32.5	300	32.5	0	0
Posts	3 214	235	7.3	1 645	51.2	1 014	31.6	297	9.2	23	0.7
Lumber	238	0	0	83	34.8	77	32.3	78	32.9	0	0
Total	4 374	247	5.7	2 038	46.6	1 391	31.8	675	15.4	23	0.5

Table 46. Markets for plywood and waferboard, 1979-80

Product	Total production ^a (M sq. ft.)	Proportional distribution by market destination						Total (%)
		Saskatchewan (%)	Alberta (%)	Manitoba (%)	Eastern Canada (%)	United States (%)	Overseas (%)	
Plywood	420 000	34	2	8	40	0	16	100
Waferboard	874 687	16	16	16	12	37	3	100

^a Based on 1/16-in. thickness.

CHAPTER VII

ANNUAL REVENUES AND EXPENDITURES IN THE FOREST INDUSTRY

This chapter describes expenditures incurred and revenues received by the Saskatchewan forest industry in 1979-80 (Table 47). Expenditures have been divided into operating and capital categories. The operating expenditure category includes the total variable and fixed costs of production. Capital expenditures are those costs incurred by firms in replacing used infrastructure and equipment, upgrading obsolete infrastructure and equipment, expanding the productive capacity of existing infrastructure and equipment, and constructing new production units.

Operating Expenditures By Industry Group

Sawmill industry group

With 20% of total industry sales (\$50 762 900), this industry group is the second-largest in the Saskatchewan forest industry (Table 47).²² The largest expenditure in the group was payments to logging contractors, which equaled 38% of total revenue. Wages and salaries to company employees were the second-largest direct expenditure item, accounting for 28% of sales, and 3% of total revenue was spent on fuel and electricity.

Independent planing mill industry group

Sales in this group were valued at \$2 008 547, representing 1% of total forest industry sales. The leading expenditure was for wood inputs, with purchases equaling 53% of sales. Purchased wood inputs included rough-sawn lumber purchased or transferred from sawmills. Wages and salaries and energy expenditures equaled 24% and 2%, respectively, of sales.

Wood preservation industry group

Sales of preserved wood products totaled \$9 856 855, or 4% of total forest industry sales. Labor and energy accounted for 17% and 20%, respectively, of the total sales. The industry had the lowest proportionate labor cost of any of the five groups.

Miscellaneous industry group

The total sales value of products such as lath, pallets, posts, and building logs was \$2 369 569, or 1% of forest industry sales. Wages and salaries equaled 25%

of industry group sales and energy costs accounted for about 2% of sales.

Pulp, waferboard, and plywood industry group

The three mills in this group accounted for 74% of total sales of the Saskatchewan forest industry. Wage and salary expenditures amounted to \$35 167 400, or 19% of total revenues. This group of mills accounted for 65% of wages and salaries paid by the entire Saskatchewan forest industry.

The second major expenditure was the acquisition of materials and supplies. Expenditures on a wide range of materials such as caustic sodas, chlorine, sodium chlorate, glue, and a number of other items amounted to \$32 million.

Both on absolute and relative bases, this industry group spent more on energy than any other industry group. The \$10 million spent amounted to 85% of the fuel and electricity bill for the entire forest industry. Within this group, energy costs equaled 5.6% of sales. The comparable figures for other industry groups are shown in Table 47.

Annual Capital Expenditures

As opposed to operating expenditures, which are costs of production, capital expenditures are revenue-generating investments that are intended either to create profits (for private enterprises) or to achieve a desired social objective (for publicly owned enterprises). The gross fixed capital formation by the Saskatchewan forest industry in 1979-80 was about \$31.5 million. These funds included expenditures for construction and for purchases of machinery and equipment in both plant and woodlands operations. The distribution of capital into the various categories is shown in Table 48. Plant machinery and equipment represented the greatest capital expenditure.

Cost Of Wood Inputs

In the primary wood-using industry survey, no attempt was made to differentiate expenditures incurred in procuring wood from expenditures incurred in the final processing of wood. Many of the firms could not provide

²² To ensure confidentiality, pulp, plywood, and waferboard mills have been aggregated into one industry grouping for this chapter.

Table 47. Revenues and operating expenditures by industry group, 1979-80

	Sawmills		Independent planing mills		Wood preservation		Miscellaneous		Pulp, plywood, and waterboard mills ^a	
	(\$)	(%)	(\$)	(%)	(\$)	(%)	(\$)	(%)	(\$)	(%)
Values of sales (f.o.b. mill)	50 762 900	20.1	2 008 500	0.8	9 856 800	3.8	2 369 600	0.9	187 627 100	74.3
Fuel and electricity	1 463 500	2.9	40 200	2.0	238 300	2.4	56 800	2.4	10 521 800	5.6
Materials and supplies	212 400	0.4	28 200	1.4	IR	—	IR	—	32 089 500	17.1
Maintenance and repairs	3 777 400	7.4	61 000	3.0	IR	—	IR	—	12 828 200	6.8
Purchased wood inputs—roundwood or semiprocessed ^b	994 500	1.9	1 056 000	52.6	IR	—	IR	—	15 506 900	8.3
Payments to contractors	19 167 900	37.8	0	0	IR	—	IR	—	12 293 700	6.6
Payments to provincial government (stumpage, etc.)	2 383 200	4.7	0	0	IR	—	IR	—	1 432 100	0.8
Wages and salaries	14 468 500	28.5	484 500	24.1	1 653 400	16.8	590 500	24.9	35 167 400	18.7
General and administration	1 295 000	2.6	14 200	0.7	IR	—	IR	—	1 956 000	1.0
Others ^c	7 000 500	13.8	324 400	16.2	7 965 000	80.8	1 722 300	72.7	65 831 500	35.1

^a Estimated using secondary data sources.^b Semiprocessed inputs include items such as rough lumber for independent planing mills, chips for pulp production, etc.^c Includes depreciation, taxes, and unallocated residuals and profits.

IR Insufficient response.

Table 48. Distribution of capital expenditures for the Saskatchewan forest industry, 1979-80

Type of capital expenditure	% of total capital expenditures ^a
Plant construction	14
Plant machinery and equipment	46
Woodlands construction	10
Woodlands machinery and equipment	30

^a This distribution is based on responses by a cross section of firms, which does not include all operations.

information on the exact proportion of particular types of costs (e.g., wages and salaries, fuel and electricity, and materials and supplies) expended in either woodlands or processing operations. As a result, the expenditures shown in the first section of this chapter and in Table 47 include both wood procurement and processing costs. The firms did, however, indicate average per-unit cost of fiber inputs (an average of all costs incurred in harvesting and transporting the wood from the forest to the mill on a per-unit input basis).

In relation to other specific costs (e.g., wages and salaries, fuel and electricity, and materials and supplies), the cost of roundwood supplied to the mill represented the greatest single cost of production²³. The importance of wood costs in the total cost of manufacturing forest products is emphasized in the review of the Canadian Forest Products Industry published by the federal Department of Industry, Trade and Commerce (1978, p. 169). The review notes the following:

Wood represents the largest single cost component in the manufacture of lumber, pulp, newsprint, and other

primary products and therefore is a principal factor determining a manufacturer's competitive position in world markets. The fact that there appears to be less regional variation in the aggregate of all other manufacturing costs for plants of similar scale and vintage further illustrates the importance of competitive wood costs.

To illustrate the extent and variation in wood fiber costs in Saskatchewan, information is provided for the sawmill industry group by category (Table 49 and Figure 6). The weighted average cost of delivered roundwood was \$55 per cunit. Based on the proportion of final per-unit product value spent on harvesting and delivering wood to the mill gate, wood costs accounted for 49% of final sales.

A cross-sectional observation of wood costs for the sawmill industry group shows that unit costs are lower for smaller mills than for larger ones. This trend may be explained by the lower average haul distances for small mills in comparison to large mills. For small mills producing less than 100 M fbm per year the average haul was 8 miles; the average haul increases in each successively larger mill class and reaches 55 miles for the large mill class. Shorter hauling distances, however, do not fully explain the lower delivered input costs in the smaller mills. Figure 6 shows the distribution of total input costs between harvesting and transportation for large mills and mills producing 100 M to 1 MM fbm annually. Although transportation costs are lower for the latter group of mills, the relative decline is not as large as the decline in harvest costs (including felling and skidding). A number of reasons, including lower unit capital and labor costs, shorter skidding distances, differences in the characteristics of wood handled (e.g., small logs vs. large logs), and differences in terrain, could explain this disparity.

²³ This fact has been recognized in a number of studies including F.L.C. Reed and Associates Ltd. (1973); Teskey and Smyth (1975b); Sandwell Management Consultants Ltd. (1977); and the Ontario Ministry of Natural Resources (1981).

Table 49. Wood input costs as a proportion of final product value by sawmill size, 1979-80

Annual production	Weighted average wood input cost		Weighted average one-way haul (miles)	Weighted average wood input cost (\$ per M fbm)	Weighted average product value (\$ per M fbm)	% of per unit product value spent on wood input
	\$ per cunit ^a	Range of \$ per cunit				
5 MM fbm and over	56	31-60	55	94	187	50
1 MM to 5 MM fbm	39	36-42	42	65	204	32
100 M to 1 MM fbm	32	10-51	33	53	199	26
Less than 100 M fbm	25	7-45	8	41	157	26
Total all sawmills	55	7-60	54	91	188	49

^a 1 cunit = 100 cu. ft. of roundwood.

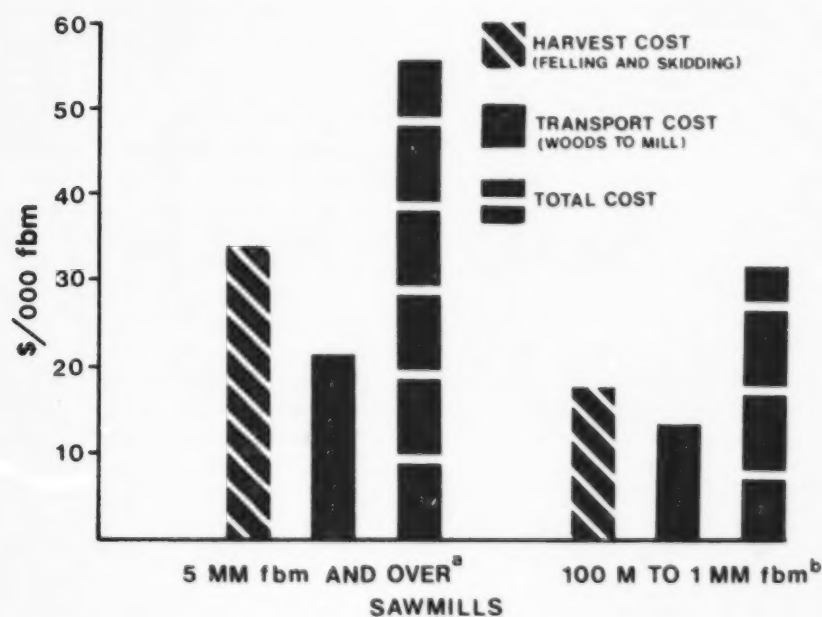


Figure 6. Wood cost components by sawmill size, 1979-80.

CHAPTER VIII

THE SOCIOECONOMIC IMPACT OF THE FOREST INDUSTRY IN SASKATCHEWAN

No single criterion exists that can accurately measure the socioeconomic contribution of a particular industry to a regional, provincial, or national economy. In this report, the economic contribution of the Saskatchewan forest industry has been assessed using information on employment, wages and salaries, value added, value of provincial exports, and community stability.

Employment And Wages and Salaries

The employment impact of the Saskatchewan forest industry was discussed in Chapter IV. In this section the economic impact of the forest industry is discussed by relating aspects of forest industry employment (including proportion of product-value spent on wages and salaries, total number employed, total wages and salaries paid, and average income per employee) to other manufacturing industries within the Saskatchewan economy.²⁴

The total employed labor force in Saskatchewan in 1979 was 433 000 persons (Saskatchewan Bureau of Statistics 1981). Approximately 20 051 persons (5% of total employment) were employed in the manufacturing sector. The forest industry (primary wood-using) accounted for 8.1% of the jobs and 9% of total wages and salaries paid by all industries within the manufacturing sector. Table 50 shows the forest industry (primary wood-using) ranked third in average income per employee, sixth in total number employed, and fifth in total wages and salaries paid within the manufacturing sector.

Total person-years of employment (including company and contract employment), total wages and salaries paid (including company and contract), and average income per employee for each of Saskatchewan's forest industry groups are shown in Table 51. The pulp, plywood, and waferboard industry groups provided the most jobs and showed the highest income per employee.

The percentage of the total value of shipments of manufactured goods expended on wages and salaries among different industries in Saskatchewan's manufacturing sector is shown in Table 52. Relative to other industries, the forest products industry was labor-intensive. Wages and salaries equaled 25% of the total value

of shipments, compared to 17% in the manufacturing sector as a whole.

The proportion of final sales expended on wages and salaries for each of Saskatchewan's forest industry groups is shown in Table 53. The sawmill industry group spent the most on labor, with 28% of total revenues expended on wages and salaries. The corresponding figure for the pulp, plywood, and waferboard industry group was 19%. Wages and salaries were the greatest single expenditure in the pulp, plywood, and waferboard group and the second largest expenditure in the sawmill industry group in 1979-80 (Table 47).

Value Added

Value added is defined by Bannock et al. (1978) as follows:

The difference between total revenue of a firm, and the cost of bought-in raw materials, services and components. It thus measures the value which the firm has 'added' to these bought-in materials and components by its processes of production.

The value added generated by a particular industry is a measure of that industry's contribution to total provincial income (measured by gross provincial product) and is thus a valuable parameter for assessing the economic contribution of the forest industry. Value-added measures have two additional attributes. First, they avoid double counting of production. Second, they can be meaningfully related to levels of input use (labor and capital) employed by the industry (Statistics Canada 1979).

Saskatchewan's gross provincial product (GPP) in 1979 was \$11 000 million, of which the goods-producing sector accounted for 48% (Figure 7). The manufacturing sector represented 13% of the goods-producing sector and 6% of the GPP. The forest products industries, including primary, secondary, and tertiary wood-users, accounted for 19% of the total value added created by all manufacturing industries in the Saskat-

²⁴ Different data sources are the reason for the large difference in the measures of wages and salaries, employment, and value added shown in Tables 50, 52, and 54 and the measures for these categories provided throughout the rest of this report. The values shown in Tables 50, 52, and 54 are based on Statistics Canada data. All other data have been derived from the 1980 NoFRC primary wood-using industry survey.

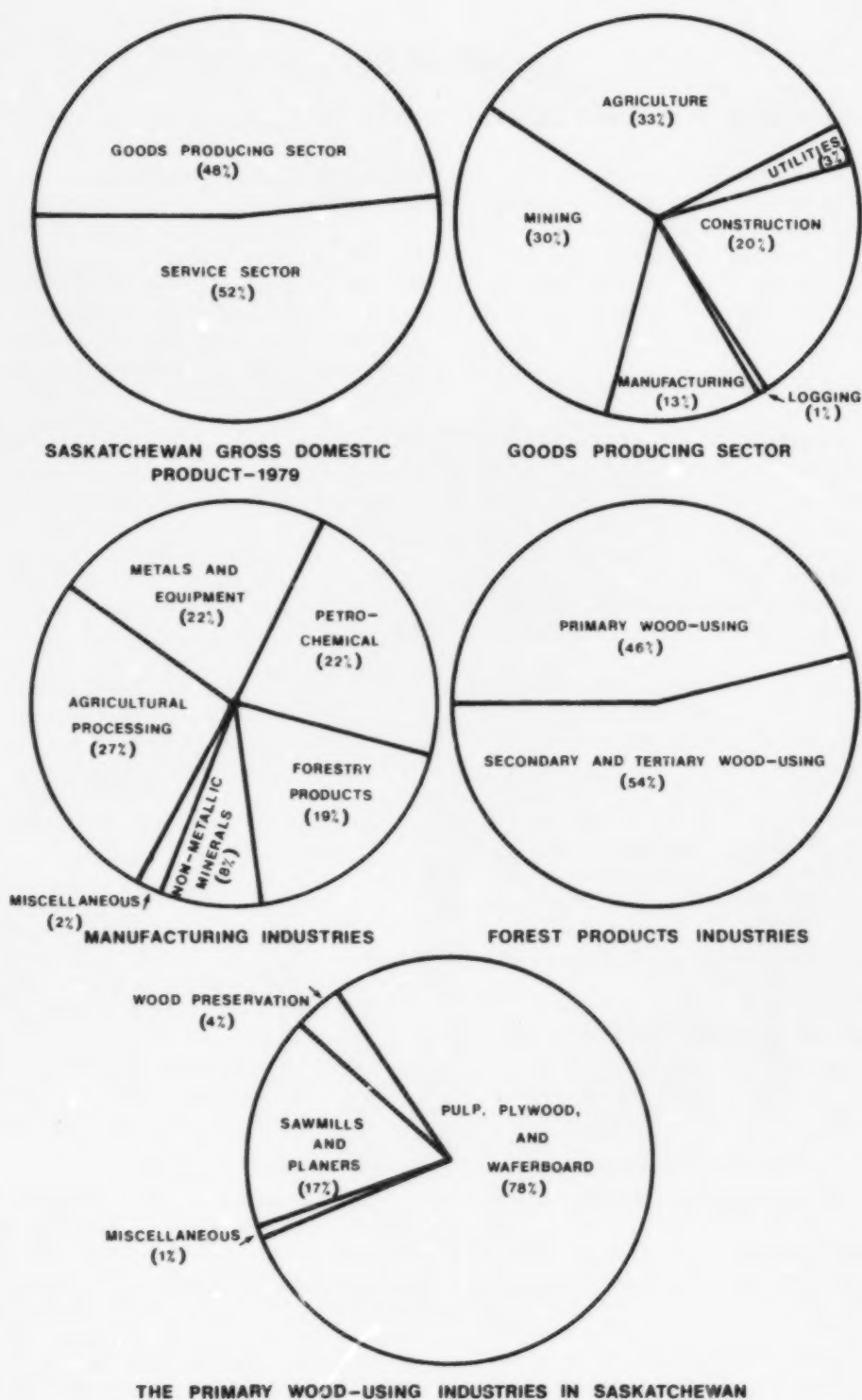


Figure 7. Relative position of the forest industry in 1979 in terms of value added.
(Sources: Statistics Canada 1982 a, b).

Table 50. Employment, earnings, and average income per employee by industry category in the manufacturing sector, 1979a

Industry group	Total annual wages and salaries paid			Total employed			Average annual income per employee	
	\$000	% of total manufacturing	Rank	No.	% of total manufacturing	Rank	\$	Rank
Food and beverage	88 793	27.5	1	5 370	26.8	1	16 535	5
Rubber and plastic products	X	X	X	X	X	X	X	X
Leather	247	0.1	14	26	0.1	14	9 500	13
Textiles	935	0.3	13	93	0.5	13	10 054	12
Clothing	5 281	1.6	11	560	2.8	10	9 430	14
Primary wood-using ^b	61 302	8.8	5	1 619	8.1	6	18 016	3
Secondary and tertiary wood-using ^c	42 792	13.2	3	3 030	15.1	2	14 123	9
Primary metal	X	X	X	X	X	X	X	X
Metal fabricating	26 157	8.1	6	1 675	8.3	5	15 616	6
Machinery	34 704	10.7	4	2 253	11.2	3	15 403	7
Transportation equipment	11 255	3.5	8	755	3.8	8	14 907	8
Electrical products	9 000	2.8	9	682	3.4	9	13 196	10
Nonmetallic mineral products	20 273	6.3	7	1 162	5.8	7	17 447	4
Chemical and chemical products	4 248	1.3	12	224	1.1	12	18 964	2
Miscellaneous manufacturing	5 186	1.6	10	473	2.4	11	10 964	11
Petroleum and coal products	X	X	X	X	X	X	X	
Residual	45 173	14.0	2	2 129	10.6	4	21 218	1
Total manufacturing	323 212	100.0		20 051	100.0		16 119	

a Source: Statistics Canada 1982a.

b Includes sawmills, planing mills, wood preservation, miscellaneous, plywood, waferboard, and pulp mills.

c Includes furniture manufacturing, wooden boxes, kitchen cabinets, etc.

X Confidential.

Table 51. Employment, earnings, and average income per employee by forest industry group, 1979-80

Industry group	Total employment (person-years)	Total wages and salaries (\$)	Average income per employee (\$/person-years)	Independent log producers and contract employment (person-years)	Estimated income to log producers and contract employment (\$)	Total estimated wages and salaries paid to own and associated employees (\$)
Sawmills	922	14 468 486	15 692	629	9 900 000	24 368 486
Independent planing mills	27	484 498	17 944	1	18 000	502 498
Wood preservation	140	1 653 400	11 810	182	2 100 000	3 753 400
Miscellaneous ^a	141	590 513	4 188	2	8 000	598 513
Pulp, plywood, and waferboard	1 285	35 167 430	27 368	301	8 200 000	43 367 430
Total	2 515 ^b	52 364 327	20 821	1 115	20 226 000	72 590 327

a Includes lath, pallets, building timbers, and post producers.

b Does not include independent log producers or contract woodlands workers.

Table 52. Sales in relation to wages and salaries in the manufacturing sector, by industry category, 1979^a

Industry	Value of shipments of goods of own manufacturing (\$000)	Wages and salaries (total activity basis) (\$000)	% of sales spent on wages and salaries
Agricultural processing	712 575	89 040	12.5
Petrochemical ^b	27 265	4 248	15.6
Metals and equipment ^c	277 667	81 116	29.2
Forest products ^d	361 427	88 713	24.6
Nonmetallic mineral products	111 242	20 273	18.2
Manufacturing	373 097	39 822	10.7
Total	1 863 273	323 212	17.4

^a Source: Statistics Canada 1982a.

^b Does not include rubber and plastic products industry or petroleum and coal products.

^c Does not include primary metals industry.

^d See Appendix 4 for industries included in this category.

Table 53. Percent of sales spent on wages and salaries by forest industry group, 1979-80

Industry group	% of sales spent on wages and salaries
Sawmills	28
Independent planing mills	24
Wood preservation	17
Miscellaneous	25
Pulp, waferboard, and plywood	19

chewan economy. The industries covered in this study (primary wood-using) accounted for 46% of the total forest products group and 9% of the manufacturing sector.

Total value added and value added per person-year in the forest industry and other groups in the manufacturing sector are shown in Table 54. The primary wood-using group ranked fifth in total value added and fourth in value added per person-year. Total value added and

value added per person-year is shown for each of the industry groups within the primary wood-using industry class in Table 55. The pulp, plywood, and waferboard industry group ranked first in both total value added and value added per employee, contributing \$101 000 000 in total value added and \$78 599 on a per person-year basis. The sawmill industry group ranked second in total value added (\$21 489 000) and fourth in value added per person-year (\$24 122). The pulp, plywood, and waferboard and sawmill industry groups accounted for 95% of total primary wood-using industry value added.

Regional Economic Base Analysis

The fundamental premise of regional base theory is described by Stewart (1978) as follows:

Most communities are unable to produce all the goods and services they require so purchases are necessary from beyond. Economic activities which produce the external income to pay for needed imports are 'basic' or export activities, while supporting activities are 'non-basic' or service activities. The theory holds that a regional economy within a developed national economy and the latter also, must produce and export goods and services to survive and prosper.

Table 54. Value added and value added per employee in the manufacturing sector by industry category, 1979a

Industry group	Total value added created			Average value added per employee	
	\$000	% of total manufacturing	Rank	\$	Rank
Food and beverage	183 131	26.4	1	34 103	5
Rubber and plastic products	X	X		X	X
Leather	175	0.0	14	6 730	14
Textiles	1 207	0.2	13	12 978	12
Clothing	8 145	1.2	11	14 545	11
Primary wood-using ^b	61 302	8.8	5	37 864	4
Secondary and tertiary wood-using ^c	72 488	10.5	4	23 923	9
Primary metal	X	X		X	
Metal fabricating	45 003	6.5	7	26 867	7
Machinery	73 962	10.7	3	32 828	6
Transportation equipment	16 701	2.4	9	22 120	10
Electrical products	17 033	2.5	8	24 975	8
Nonmetallic mineral products	55 859	8.1	6	48 071	3
Chemical and chemical products	12 117	1.7	10	54 094	2
Miscellaneous manufacturing	5 813	0.8	12	12 290	13
Petroleum and coal products	X	X		X	
Residual	139 818	20.2	2	65 673	1
Total manufacturing	692 754	100.0		34 550	

^a Source: Statistics Canada 1982a.

^b Includes sawmills, planing mills, wood preservation plants, miscellaneous mills, plywood, waferboard, and pulp mills.

^c Includes furniture manufacturing, wooden boxes, kitchen cabinets, etc.

X Confidential

Table 55. Total value added per own employee by industry group, 1979-80

Industry group	Value added		Value added per employee ^a (\$/person-year)
	(\$000)	(% of total)	
Sawmills	21 469	17	24 122
Independent planing mills	809	1	29 963
Wood preservation	4 517	3	24 682
Miscellaneous	1 140	1	8 085
Pulp, plywood, and waferboard	101 000	78	78 599
Total	128 935	100	51 266

^a Does not include contract employees.

Each of Saskatchewan's primary wood-using industries is 'basic'. Tables 44 to 46 in Chapter VI show the amount of out-of-province forest product exports; 84% of the total value of production of the forest industry is exported out of the province. This income contributes significantly to the health of the Saskatchewan economy.

The Economic Stability Of Saskatchewan's Rural Communities

The community stability concept is the primary rationale for two important and universal forest management principles sustained yield and even flow. A number of authors, including Byron (1978), Keane (1972), and Smith (1974), have argued that stability and continuity of wood supply are necessary for minimizing the negative socioeconomic impacts resulting from community and employment instability. Thus, sustained yield and even flow have become cornerstones of forest management policy.

Byron (1978) describes these policies in the following terms:

Whereas the 'nondeclining' aspect of sustained yield is meant to ensure permanence of forest industry centers, the type of community stability implicit in arguments for even-flow yield regulation is short-term; stable production, employment, and incomes each year will result from a uniform timber supply.

Hornberger (1974) suggests some general guidelines for ensuring community stability. He suggests that 25% of the total population should represent the labor supply and that "a single industry should not employ more than 5% of the labor supply initially and 10% ultimately for the financial protection of the community." Thus, if more than 2.5% of the total population of a particular community is employed in one industry, the financial security of the community is subject to the continued vitality of that industry. This report has adopted a higher estimate of 5% of the total population²⁵ employed in one industry as the guideline for determining economic dependence. Municipalities with 2.5-5.0% of their total populations employed in the forest industry are deemed to be heavily dependent on forest industry activities, and municipalities with 1.0-2.5% employed are considered marginally dependent.

Saskatchewan communities with some forest industry reliance are listed and ranked in Table 56. The communities are categorized as dependent, heavily dependent, and marginally dependent. Seven Saskatchewan communities, representing a population of 8847, were dependent on the forest industry in 1979-80. Five communities with a total population of 32 692 were heavily dependent, and an additional six communities were marginally dependent. A number of other communities accounted for additional forest industry employment. These communities were not listed because either less than 1% of each of their populations was employed in the forest industry or because necessary population information was not available.

²⁵ Participation rates in Saskatchewan are closer to 50% than the 25% that Hornberger suggests. Thus the critical value for economic dependence is 5% ($50\% \times 10\%$).

Table 56. Employment in the forest industry in some Saskatchewan communities, 1979

Employment center	Total population ^a	Forest industry employment ^b	% of population employed by forest industry
Dependent communities			
Hudson Bay	2 361	950	40.2
Big River	819	320	39.1
Carrot River	1 169	300	25.7
La Loche	77	12	16.2
Glaslyn	430	62	14.4
Little Red River Reserve	134	18	13.4
Meadow Lake	3 857	282	7.3
Total	8 847		
Heavily dependent communities			
Buffalo Narrows	598	28	4.7
Love	121	6	4.6
Endeavour	199	8	4.0
Prince Albert	31 380	1 224	3.9
White Fox	394	13	3.4
Total	32 692		
Marginally dependent communities			
Canoe Narrows	348	7	1.9
Arran	93	2	1.8
Leoville	393	6	1.6
Kisbey	228	3	1.4
Goodsoil	263	3	1.3
Paddockwood	211	2	1.1
Total	1 536		

^a Source: Saskatchewan Bureau of Statistics 1982.^b Rounded to nearest full person-year.

SUMMARY

The following summary provides highlights of the report.

Industrial Base

- Saskatchewan's primary wood-using industry in 1979-80 consisted of 316 plants, including 1 kraft pulp mill, 1 waferboard plant, 1 plywood plant, 19 wood preservation plants, 11 independent planing mills, 12 miscellaneous mills (producing building logs, pallets, lath, and posts), and 271 sawmills.

- The 271 sawmills varied in productive capacity from less than 5000 to 250 000 fbm per eight-hour shift.

- The six largest sawmills (2% of the total) accounted for 85% of Saskatchewan's lumber production.

- Of the 11 sawmills producing greater than 1 MM fbm per year, eight are government-owned. In addition the pulp mill, plywood plant, and the province's largest wood preservation plant are owned by crown corporations.

- The primary wood-using industry accounted for 8% of all jobs and 9% of wages and salaries paid in Saskatchewan's manufacturing sector in 1979.

- The total replacement value of the capital stock of Saskatchewan's primary wood-using industries was over \$550 million.

- The Prince Albert forest region accounted for the majority of operations (114), and was followed by Hudson Bay (88) and Meadow Lake (70). The majority of operations in each of these forest regions consisted of small sawmills producing less than 1 MM fbm of lumber per year.

Products

- The primary wood-using industry produced 231 million fbm of lumber, 304 000 tons of kraft pulp, 875 MM sq. ft. (1/16-in. basis) of waferboard, 420 MM sq. ft. (1/16-in. basis) of plywood, 4.4 million cu. ft. of treated products, and varying amounts of other assorted products.

- Dimension material was the major lumber product, representing 88% of total final production. About 85% of all lumber produced was planed.

- The species mix in lumber production consisted of 80% spruce, 18% pine, and 2% aspen.

- The Hudson Bay forest region produced more lumber than any other region (43% of all lumber produced), followed by the Prince Albert forest region (26%).

- All kraft pulp was produced in the Prince Albert forest region and all plywood and waferboard was produced in the Hudson Bay forest region.

- The United States is the major market for Saskatchewan's forest products, accounting for 50% of all lumber produced by sawmills and planing mills and 75% of the bleached kraft pulp production.

Economic And Social Impacts

- Gross sales of all products manufactured by the forest industry amounted to over \$253 million.

- Forest products exported to out-of-province markets brought an estimated \$212 million in external income into the province.

- Total direct employment by the forest industry was 1602 person-years in logging and 2028 person-years in manufacturing. An additional 4141 jobs were supported indirectly by the industry.

- Employees of native ancestry made up about 18% of the forest industry labor force.

- The total direct payroll of the forest industry was \$52 million and the average annual income was \$27 368 in the pulp, plywood, and waferboard industry group, \$15 692 in the sawmill industry group, \$17 944 in the independent planing mill industry group, \$11 810 in the wood preservation industry group, and \$4188 in the miscellaneous industry group.

- In addition to the total direct payroll, an additional \$20 million was estimated to have been paid to contractors' employees.

- Value added by Saskatchewan's forest industry was \$129 million. Primary wood-using industries accounted for 9% of the total value added for the manufacturing sector.

- Value added per employee was \$78 599 in the

pulp, plywood and waferboard group, \$29 963 in the independent planing mill industry group, \$24 122 in the sawmill industry group, \$24 682 in the wood preservation industry group, and \$8 085 in the miscellaneous industry group. Value added per employee in Saskatchewan's manufacturing sector averaged \$34 550.

- Seven Saskatchewan communities, with a total population of 7413, were economically reliant on the forest industry.

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APPENDIX I

STANDARD INDUSTRIAL CLASSIFICATION LISTINGS FOR FOREST INDUSTRIES, 1980^a

Standard Industrial
Classification Code

DIVISION C — LOGGING AND FORESTRY

Major Group 4 — Logging 041

Logging 0411

Major Group 5 — Forestry services 051

DIVISION E — MANUFACTURING INDUSTRIES

Major Group 25 — Wood industries

Sawmills, planing mills, and shingle mills 251

a) Shingle and shake industry 2511

b) Sawmills and planing mills 2512

Veneer and plywood mills 252

Sash, door, and other millwork plants 254

Wooden box and pallet industry 256

a) Wooden box and pallet industry 2561

Miscellaneous wood industries 259

a) Wood preservation industry 2591

b) Particle board industry 2592

c) Waferboard 2593

d) Other wood industries 2599

Major Group 27 — Paper and allied products industries

Pulp and paper mills 271

Paper box and bag industries 273

Other converted paper products industries 279

^a Source: Statistics Canada 1980. Standard industrial classification manual. Cat. No. 12-501E. Ottawa, Ontario.

APPENDIX 2

SELECTED METRIC (SI) UNITS AND CONVERSION FACTORS^a

Imperial		Metric (SI)
1 inch	=	2.54 cm
1 mile	=	1.609 km
1 acre	=	0.405 ha
1 square mile	=	2.590 km ²
1 cord (85 cubic feet (cu. ft.) solid wood)	=	2.407 m ³
1 cu. ft.	=	0.028 m ³
1 cunit (100 cu. ft. solid wood)	=	2.832 m ³ (roundwood)
1 ton (2000 lb.)	=	0.907 t
1 cord (stacked) per acre	=	8.956 m ³ (stacked) per ha
1000 board feet	=	4.29 m ³ (roundwood)
1 M foot board measure (fbm)	=	1.623 m ³ (lumber)
1 bone dry unit (BDU) wood chips (2400 lb.)	=	1090 kg
1 bale of shavings (30 lb.)	=	14 kg
1 sq. ft. of sheet product (1/2-in. basis)	=	1.180 m ² (1-mm basis)
1 sq. ft. of sheet product (1/16-in. basis)	=	0.147 m ² (1-mm basis)
M	=	thousand
MM	=	million

^a Source: Environment Canada 1974. Selected metric (SI) units and conversion factors for Canadian forestry. Environ. Can. Ottawa, Ontario. Unnumbered.

Conversion Factors for Timber Products

These factors are approximate values and may vary depending upon tree size, manufacturing practice, species, etc.

Timber product		Equivalent value
1 cunit (100 cu. ft.)	=	660 fbm (roundwood)
Grade #1 railway ties (7" × 9" × 8")	=	42 fbm
Grade #2, #3 railway ties (6" × 8" × 8")	=	32 fbm
1 bundle (50 pieces) of lath	=	9 fbm
Fence posts (per piece):		
6' × 3 1/2" top diameter	=	0.4 cu. ft.
6' × 4 1/2" top diameter	=	0.7 cu. ft.
6' × 5 1/2" top diameter	=	1.0 cu. ft.
7' × 3 1/2" top diameter	=	0.5 cu. ft.
7' × 4 1/2" top diameter	=	0.8 cu. ft.
7' × 5 1/2" top diameter	=	1.2 cu. ft.
8' × 5 1/2" top diameter	=	1.3 cu. ft.
8' × 6 1/2" top diameter	=	1.8 cu. ft.
8' × 7 1/2" top diameter	=	2.4 cu. ft.
8' × 8 1/2" top diameter	=	3.2 cu. ft.
Power and telephone poles	=	9-30 cu. ft. (depending on size)

APPENDIX 3**SEASONALITY OF EMPLOYMENT BY
FOREST INDUSTRY GROUPS, 1979**

Figure A. Seasonality of employment in sawmills
5 MM fbm and over annual production.

Figure B. Seasonality of employment in sawmills
1 MM to 5 MM fbm annual production.

Figure C. Seasonality of employment in sawmills
100 M to 1 MM fbm annual production.

Figure D. Seasonality of employment in sawmills less
than 100 M fbm annual production.

Figure E. Seasonality of employment in independent
planing mills.

Figure F. Seasonality of employment in the plywood
mill.

Figure G. Seasonality of employment in the wood
preservation industry group.

Figure H. Seasonality of employment in the wafer-
board mill.

Figure I. Seasonality of employment in the pulp mill.

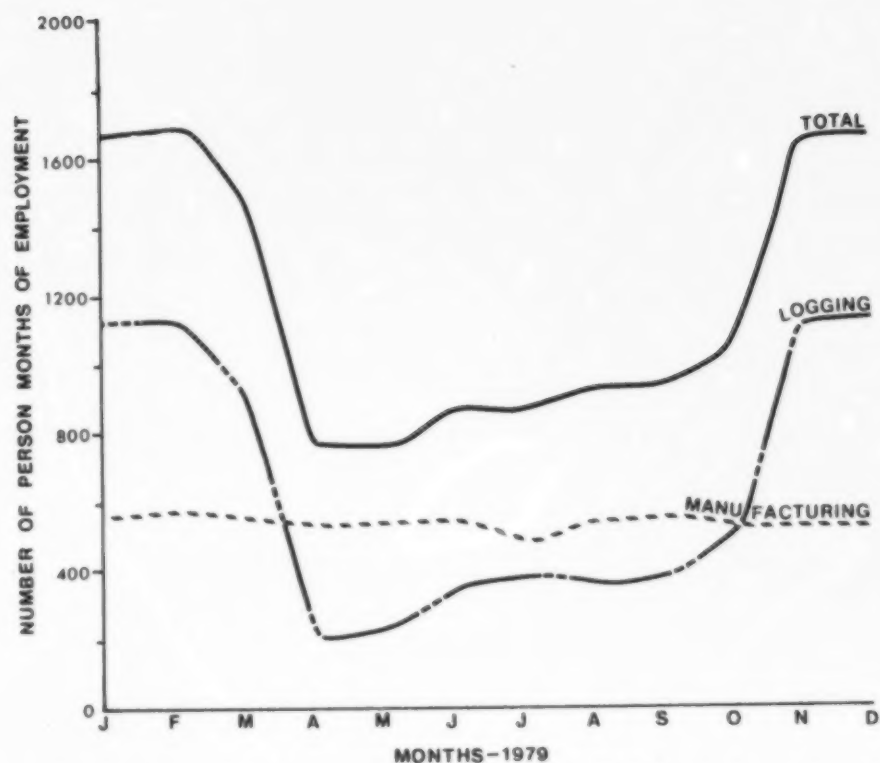


Figure A. Seasonality of employment in sawmills 5 MM fbm and over annual production.

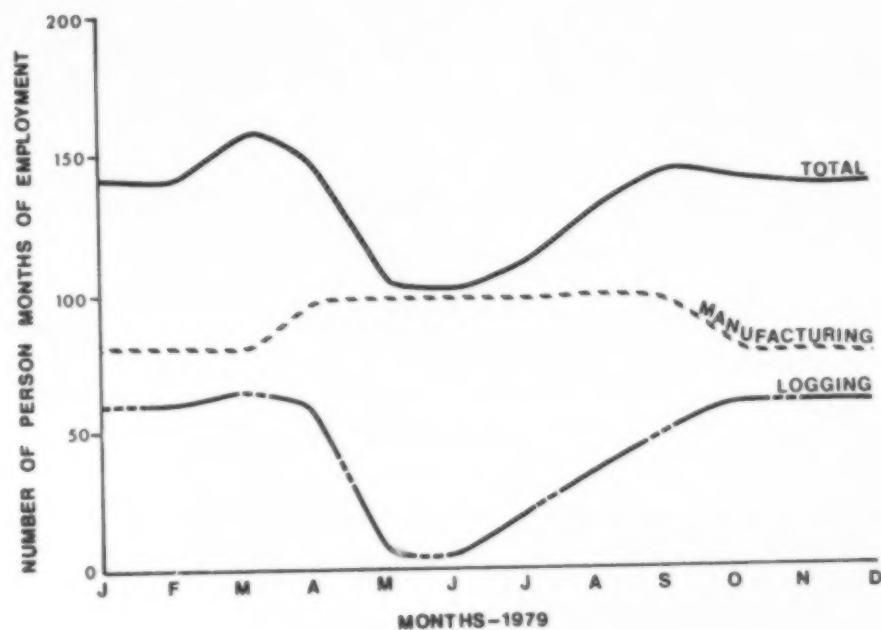


Figure B. Seasonality of employment in sawmills 1 MM to 5 MM fbm annual production.

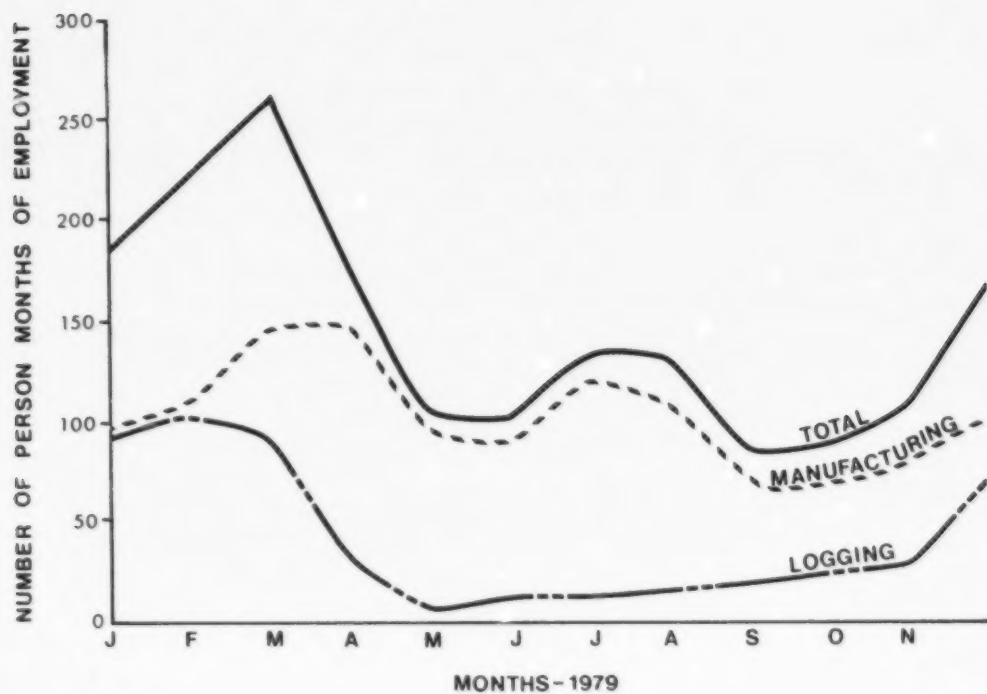


Figure C. Seasonality of employment in sawmills 100 M to 1 MM fbm annual production.

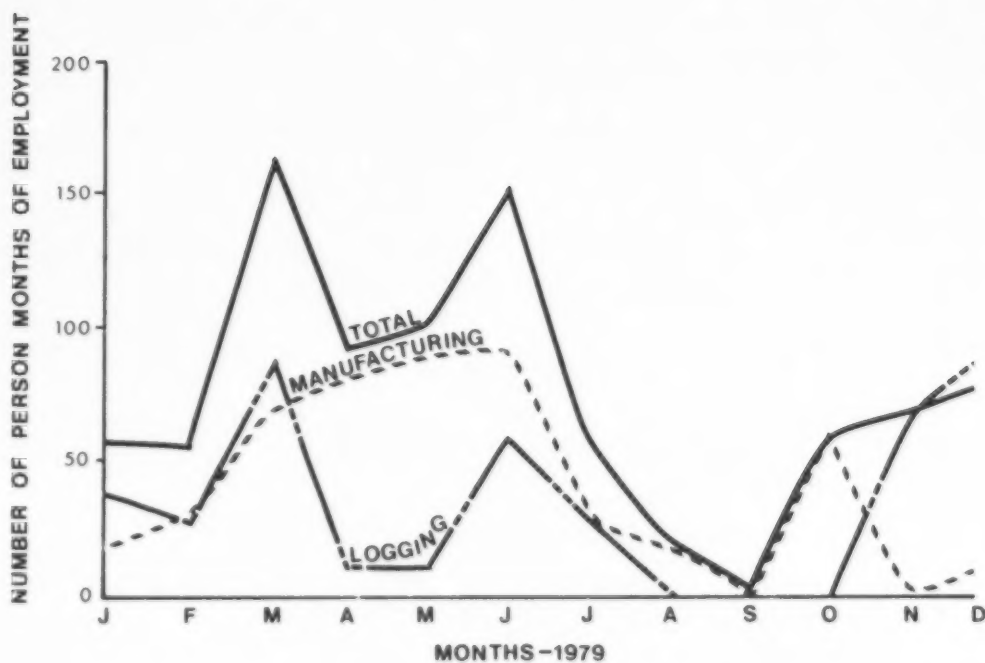


Figure D. Seasonality of employment in sawmills less than 100 M fbm annual production.

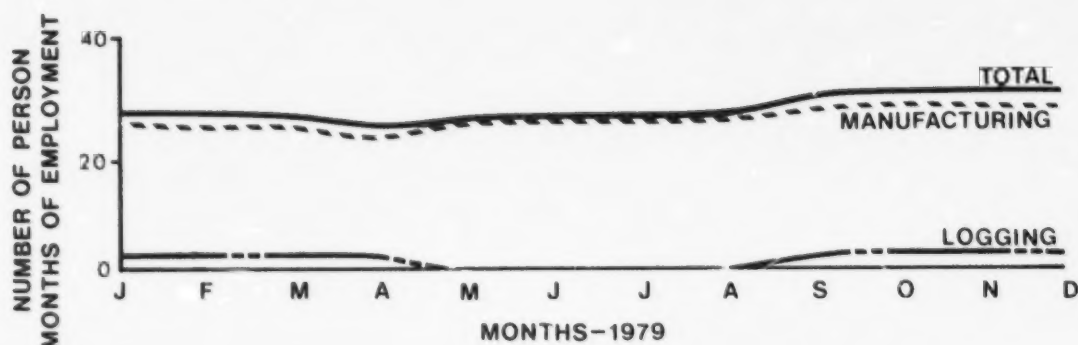


Figure E. Seasonality of employment in independent planing mills.

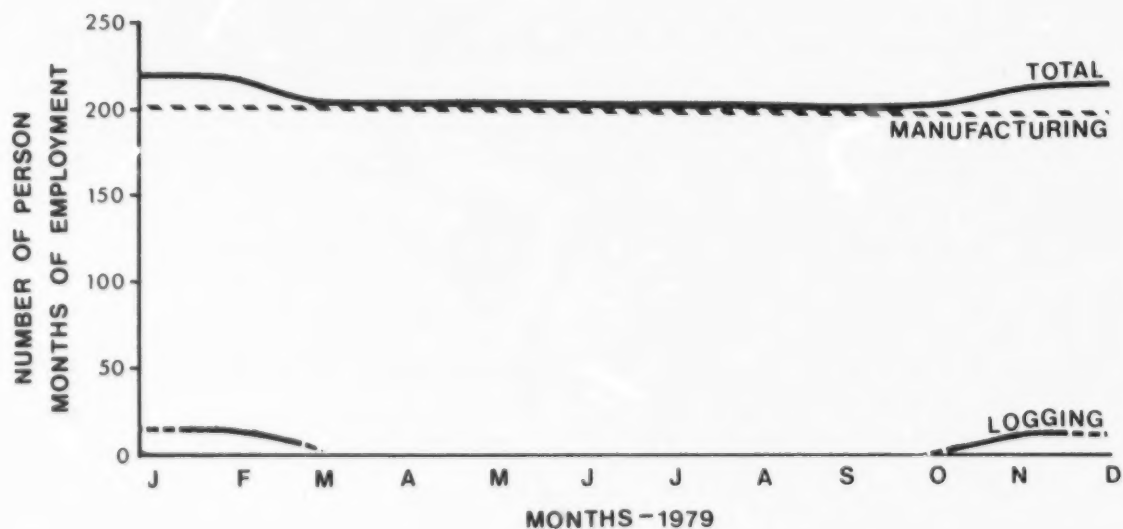


Figure F. Seasonality of employment in the plywood mill.

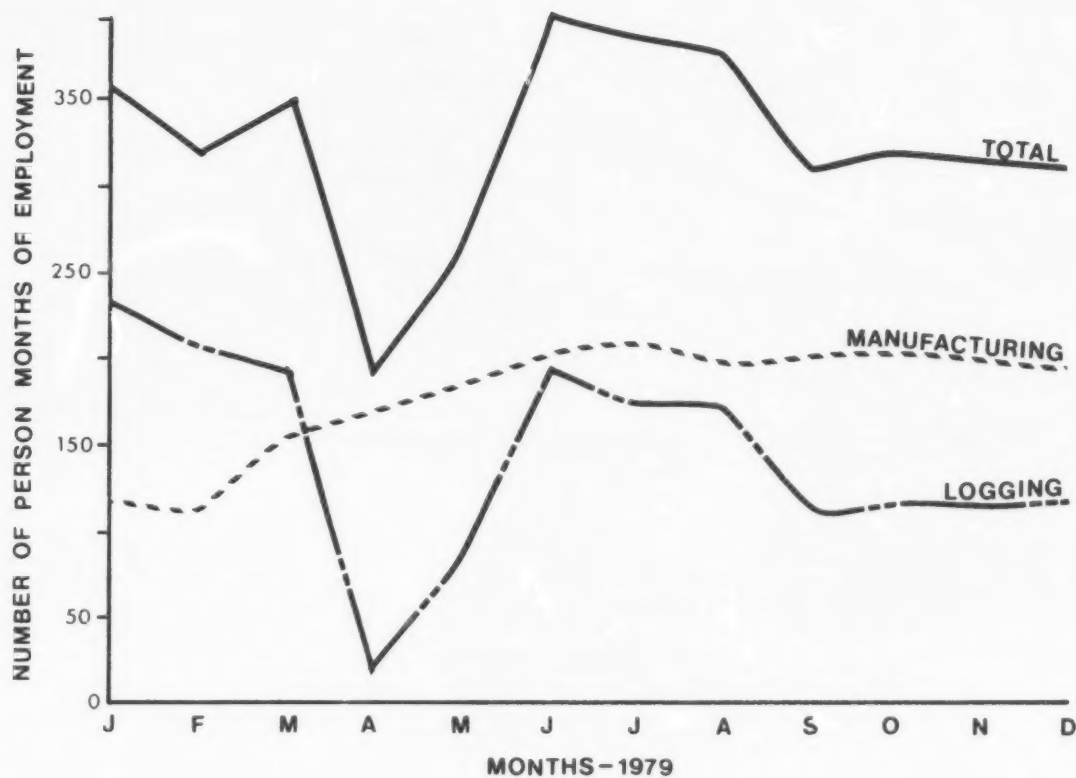


Figure G. Seasonality of employment in the wood preservation industry group.

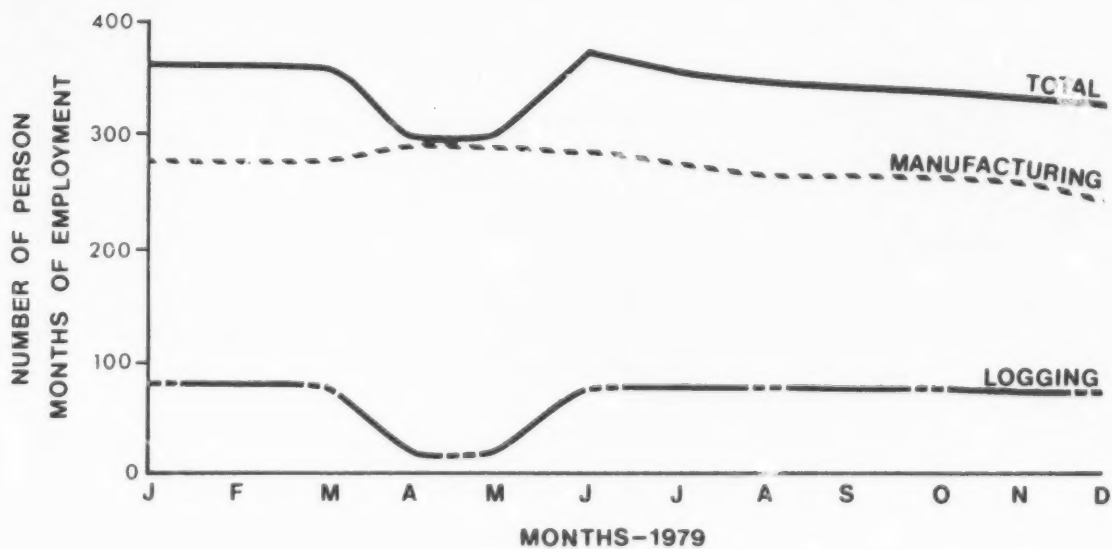


Figure H. Seasonality of employment in the waferboard mill.

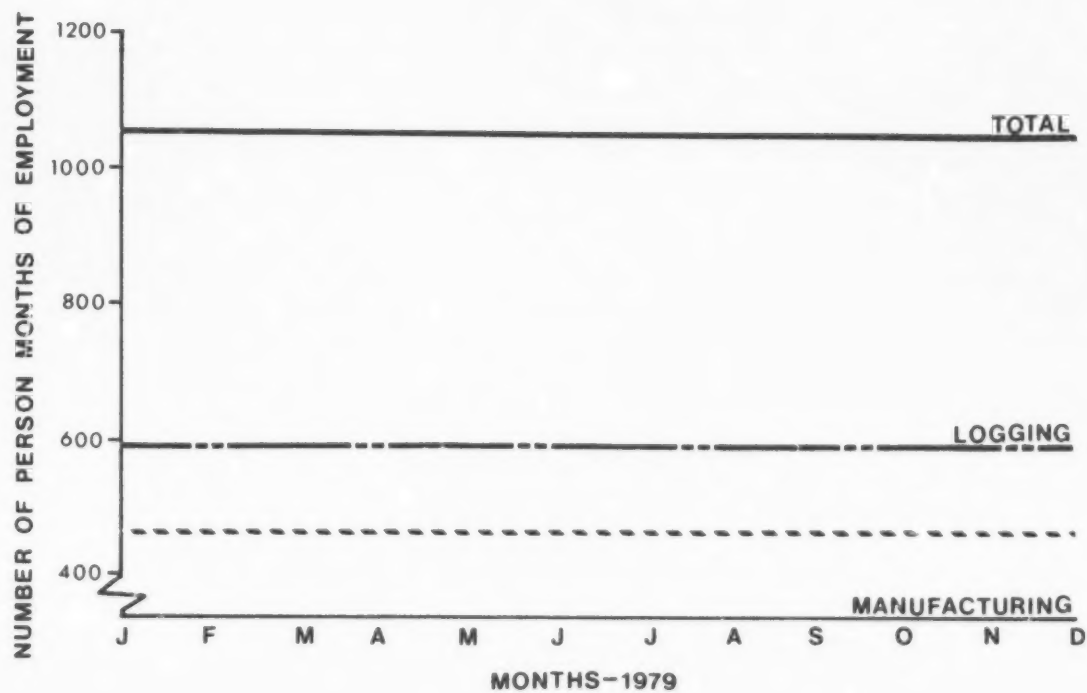


Figure 1. Seasonality of employment in the pulp mill.

APPENDIX 4

FOREST INDUSTRY GROUPS

Industry group	Standard Industrial Classification Code
Primary industries	
1. Sawmills and planing mills	2513
2. Veneer and plywood mills	2520
3. Wood preservation industry	2591
4. Miscellaneous wood industries, N.E.S.	2599
5. Pulp and paper mills	2710
6. Asphalt roofing manufacturers	2720
Secondary and tertiary industries	
7. Sash, door, and other millwork, N.E.S.	2541
8. Prefabricated buildings (wood frame)	2543
9. Manufacturers of wooden kitchen cabinets	2544
10. Wooden box factories	2560
11. Coffin and casket industry	2580
12. Furniture re-upholstery and repair	2611
13. Household furniture and fixture manufacturers	2619
14. Office furniture manufacturers	2640
15. Miscellaneous furniture and fixture manufacturers	2660
16. Folding carton and set-up box manufacturers	2731
17. Corrugated box manufacturers	2732
18. Paper and plastic bag manufacturers	2733
19. Miscellaneous paper converters	2740
20. Commercial printing	2860
21. Plate making, typesetting, etc., industry	2870
22. Publishing only	2880
23. Publishing and printing	2890